NETWORKED INFORMATION TECHNOLOGIES

Diffusion and Adoption

Edited by
Jan Damsgaard
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IFIP – The International Federation for Information Processing

IFIP was founded in 1960 under the auspices of UNESCO, following the First World Computer Congress held in Paris the previous year. An umbrella organization for societies working in information processing, IFIP's aim is two-fold: to support information processing within its member countries and to encourage technology transfer to developing nations. As its mission statement clearly states,

> *IFIP's mission is to be the leading, truly international, apolitical organization which encourages and assists in the development, exploitation and application of information technology for the benefit of all people.*

IFIP is a non-profitmaking organization, run almost solely by 2500 volunteers. It operates through a number of technical committees, which organize events and publications. IFIP's events range from an international congress to local seminars, but the most important are:

- The IFIP World Computer Congress, held every second year;
- Open conferences;
- Working conferences.

The flagship event is the IFIP World Computer Congress, at which both invited and contributed papers are presented. Contributed papers are rigorously refereed and the rejection rate is high.

As with the Congress, participation in the open conferences is open to all and papers may be invited or submitted. Again, submitted papers are stringently refereed.

The working conferences are structured differently. They are usually run by a working group and attendance is small and by invitation only. Their purpose is to create an atmosphere conducive to innovation and development. Refereeing is less rigorous and papers are subjected to extensive group discussion.

Publications arising from IFIP events vary. The papers presented at the IFIP World Computer Congress and at open conferences are published as conference proceedings, while the results of the working conferences are often published as collections of selected and edited papers.

Any national society whose primary activity is in information may apply to become a full member of IFIP, although full membership is restricted to one society per country. Full members are entitled to vote at the annual General Assembly, National societies preferring a less committed involvement may apply for associate or corresponding membership. Associate members enjoy the same benefits as full members, but without voting rights. Corresponding members are not represented in IFIP bodies. Affiliated membership is open to non-national societies, and individual and honorary membership schemes are also offered.

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IFIP TC8 / WG8.6 Working Conference on the Diffusion and Adoption of Networked Information Technologies October 6–8, 2003, Copenhagen, Denmark

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Editors' preface

For the seventh time in the ten years the working group has existed people from different parts of the world gathered to discuss issues related to the Transfer and Diffusion of Information Technology. The theme of the 10th anniversary IFIP 8.6 working group event was "The Diffusion and Adoption of Networked Information Technologies". Once again researchers and practitioners met and discussed if and how we can understand and model diffusion and adoption of technological innovations.

The conference attracted 23 submissions. All submissions were double-blind refereed by members of the program committee. Eleven submissions were accepted corresponding to a 48% acceptance rate. Four panels with themes defined by the organizers were solicited. Members of the program committee reviewed the proposals for panels too.

These proceedings reflect a journey from the conceptualisation of diffusion of innovations to the implementation of technological innovations. The eleven papers and four panels included in the proceedings represent four themes, which were scheduled in four sessions during the event. The themes are not distinct nor are they exclusive. However, the four groups of papers have some communality with respect to research theme, type of innovation or realm of investigation. The four panels do in some sense serve as the glue of the four paper sessions. The editors have decided to publish the descriptions of the panels along with the eleven papers presented at the event. The objective of publishing the panel descriptions too is to provide insights in the wealth of topics undertaken in the IFIP 8.6 working group.

The first panel "IFIP 8.6 past and future", provided insights into what, where and who are involved in the IFIP WG 8.6 during the first ten years of its existence. The panel intended to be a means for setting the scene for the

event with respect to fruitful discussions related to adoption, diffusion and implementation of IT. The panellists provided different perspectives on theoretical and in particular methodological achievements and challenges of the IFIP 8.6 group. Having the panel at the opening of the event set the ideal scene for the further discussion of diffusion and adoption of IT with respect to the multiplicity of theories and methods applied by the participants.

The second panel offered at the event had the title "The role of network in the diffusion and adoption of software process improvement (SPI) approaches". This panel addressed from several angles the importance of social networks in the diffusion and adoption of software process improvement. The panel presented and discussed visual examples of SPI networks and identified their key characteristics and role players in these emergent and overlapping networks. It also showed how the network was transformed when one of the focal players left.

"Open Source software: Placebo or panacea" was the title of the third panel. Open source software receives growing attention by academics as well as by businesses. The panel addressed open source from a paradoxical angle. For example, that the source code which is considered the 'crown jewels' for many proprietary software companies should be provided freely to anyone in open source community. Another interesting aspect raised was the tension between collectivism and individualism in the management of open source communities. The panellists provided insight into these controversies from both an academic and participant point of view.

The fourth and final panel had the title "The diffusion and adoption of mobile computing". This panel explored the evolution of mobile Internet and telephony as driven by the interplay of three major forces: market needs, technological innovation, and regulatory intervention. Consequently the panel consisted of three distinct perspectives of standardization and mobile Internet diffusion. Firstly how mobile telephony standardization has been driven by and enabled by the different institutional configurations that govern the relationships between markets, innovation system and regulatory bodies. Secondly how wireless Internet standardization efforts embed designs can be interpreted in the light of theories of design and implementation. And finally what factors in the market may influence the adoption and diffusion of such technologies and what are the important inhibitors to the diffusion and adoption of mobile Internet?

Paper Session 1: Non-classical approaches to diffusion and adoption of IT. This Session included three contributions, which used other approaches than Rogers or other more traditional factor oriented diffusion theories to interpret data and explain adoption and diffusion. These three contributions are:

The Socio-Political Construction of CareSys: How Interest and Values Influence Computerization by Karin Hedström from Orebro University. The paper describes an analytical framework, which can be used for comparing how different groups experience the value of IT. As the actors' interests and values are uncovered the framework illuminates the socio-political process of computerization.

Information and Communication Technologies Diffusion in Industrial Districts: An Interpretive Approach by Caterina Muzzi from Luiss Guido Carli School of Management and Karlheinz Kautz from Copenhagen Business School. The paper reviews the diffusion of network technologies in the Italian industrial districts by applying an interpretive process framework. The authors demonstrate that the social process and the context characterise the district as a peculiar socio-economic reality. Based on empirical findings the authors argue that the different trends in diffusion depend both on technological/economic reasons and socio-cultural issues.

Where is the Innovation? The Adoption of Virtual Workspaces by Kristian Billeskov Bøving and Keld Bødker from RUC – Roskilde University. The paper describes a case study of the introduction of a web-based groupware application – Lotus QuickPlace™ – in a large European financial organization. The study challenges the commonly held assumption in DOI research that "all use is equal" in the process of adoption of technologies. The authors argue that underlying problem is that in order to understand the diffusion of groupware, it is necessary to distinguish between two separate innovations. The first is directly related to the DOI "innovation-decision process" – centred on the technology as the innovation, whereas the second innovation is more related to how the technology is put to use.

Paper Session 2: Diffusion and adoption of IT in public sector institutions. Submissions to the event reflected the ongoing developments in the IS research community. One of those topics, which has caught attention in the IS community recently is eGovernment and the significance of IT in the public sector. Three contributions related to IT in the public sector were included in this session:

Management and Co-ordination of eGovernment by Pål Sørgaard from Telenor R&D. The author argues that eGovernment is a move towards more use of networked information technologies in governments' services to citizens and companies. It is claimed that there will be strong expectations that these services are well co-ordinated and interoperable with the applications of citizens and companies. IT co-ordination is difficult, expensive and risk prone. The wide range of products and services in government makes co-ordination even harder. It is therefore suggested that co-ordination of eGovernment should be carefully prioritised and the ambitions should be set at a reasonable level.

Translations in Network Configurations: A Case Study of System Implementation in a Hospital by Agneta Nilsson from Department of Informatics, Göteborg University, Miria Grisot from Department of Informatics, Oslo University, and Lars Mathiassen from Computer Information Systems, Georgia State University. This paper reports from an interpretive case study of a hospital where the replacement of paper based order forms for radiology examinations with web based order forms is observed. The aim of the study is to contribute to a better understanding of the implementation of networked technologies in healthcare. The case shows how the implementation of network technology imposes a configuration in the actor-network and illustrates the importance of small steps and translations involving many different actors in the process leading to a new stabilized configuration.

MIS and the Dynamics of Legitimacy in Health Care by Kåre Lines from Nord-Trøndelag University College, Kim Viborg Andersen from Copenhagen Business School, and Eric Monteiro from Norwegian University of Science and Technology. The authors combine actor-network and neo-institutional theory, for reconstructing the MIS development and use in a Norwegian local public health care organization. Rooted in research of governmental IT and the corresponding implementation at the municipality level, the paper focuses on how the MIS project must be recognized both as an expression of institutionally infused change and as an actor-shaped change effort. More specifically, through a historical reconstruction of the years 1987-2000, it is spelled out how the MIS project legitimizes – and is legitimized by – the different types of logic at play: administrative, professional and democratic.

Paper Session 3 "Stakeholders in the diffusion and adoption process" focused on different levels and types of stakeholders. Two of the submitted papers were assessed to fit to this theme.

Role Model for the Organisational IT Diffusion by Jan Pries-Heje from The IT University of Copenhagen. In this paper it is argued that organisational IT diffusion is a complicated process. Certain roles have to be filled and enacted to ensure success. However, in diffusion and adoption projects is it often forgotten to fill the roles appropriately. Based on an empirical study in a Scandinavian company this paper presents a model to be used for filling and handling the primary roles in an organisational IT diffusion process. The model was developed using action research with three cycles of diagnosis-action and learning. The main sources of the model were change management theory, diffusion of innovation theory and soft systems methodology.

Should Buyers Try to Shape IT-Markets through Non-Market (Collective) Action? Antecedents of a Transaction Cost Theory of Network Effects by Kai

Reimers and Mingzhi Li from School of Economics and Management, Tsinghua University. The authors of this paper develop a transaction cost theoretic model of network effects and apply it to assess the chances of user groups to influence the range of technological choices available on the market. The theoretical basis of the model is formulated by a number of empirically refutable propositions, which overcome some conceptual and empirical difficulties encountered by the traditional interpretation of network effects as (positive) network externalities.

Paper Session 4: Expanding the diffusion area. The element of expansion refers to two aspects both the domain of adoption and diffusion and the reach of the diffusion and adoption concepts.

Exploring Application Service Provision: Adoption of the ASP concept for provision of ICTs in SMEs by Björn Johansson from Department of Informatics, Jönköping International Business School, Jönköping University. The paper provides an exploratory empirical survey of Application Service Providers (ASPs) and their clients. The research focuses on what Small and Medium-sized Enterprises (SMEs) base their decision on when adopting the ASP concept. The study identifies three main reasons for clients to adopt the ASP concept: core competence, a lack of skilled personnel and the organizations overall strategy.

A Framework for the Investigation of the Institutional Layer of IT Diffusion: Using stakeholder theory to analyse electronic commerce diffusion by Anastasia Papazafeiropoulou from Department of IS and Computing, Brunel university. The author states that information technology diffusion is a complex process that has been studied from various perspectives and levels of analysis. Most studies have been done at firm level seeking to find the ways a technical innovation is introduced and used by a company. In this paper focus is at the institutional layer of IT diffusion by investigating the interaction between actors in the demand and supply side of the diffusion process. It is argued that stakeholder analysis is a useful tool for the examination of such interactions and a framework for the investigation of the diffusion of electronic commerce is proposed.

Taking Organizational Implementation Seriously: The Case of IOS Implementation by Jukka Heikkilä and Hannu Vahtera from Department of Computer Science & IS, University of Jyväskylä and Pekka Reijonen from Laboris, University of Turku. The authors claim that despite of the rapid technical development, failures in information systems implementation are common and it seems obvious that the implementation of inter-organizational systems (IOS) include all the same possibilities for failures as intra-organizational systems – and unfortunately even some more. In this paper some empirically proven means for avoiding problems during the implementation of IOSs are presented.

The organizers would like to thank all participants for active and enthusiastic involvement in the activities that took place during the conference. This involvement provided fruitful discussions, which hopefully animated the members of IFIP WG8.6 to continue their work on the diffusion of IT but in particular also gave potential members an appetite on the theme as a future path for research. Thank you to the general chair, Kalle Lyytinen, and a special thanks to Professor M. Lynne Markus and vice-president of sales Peter Lund from Bluetags.com, who shared their insights on diffusion of innovations in their keynotes at the event. Finally, we would like to use this opportunity to thank FUHU – The Danish Society for the Advancement of Business Education – for the grant, which made it possible to organize a memorable conference dinner at the Kronborg Castle.

Jan Damsgaard and Helle Zinner Henriksen
Co-organizing chairs and editors

Chapter 1

THE SOCIO-POLITICAL CONSTRUCTION OF CARESYS

How Interests and Values Influence Computerization

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Abstract The purpose of this paper is to describe an analytical framework, which can be used for comparing how different groups experience the value of IT. As the actors' interests and values are uncovered the framework illuminates the socio-political process of computerization. In order to validate the framework the paper exemplifies how it has been used in one case study involving the introduction of a new IT system in elderly care. For pedagogical reasons, the analysis is limited to comparing two actor groups' experiences of the introduction of the new system – the politicians, and the home-help assistants. The result also shows that non-action is very important as a way to influence the usage and construction of a new IT system.

Key words Evaluation, Computerization, Home-help, Actor sensitive evaluation, Negotiation

1. INTRODUCTION

This paper argues that computerization is a socio-political process (Danziger et al. 1982; Iacono et al. 1996) where the success or failure of a new technology is in the hand of the actors (Latour 1986), and that it is important to understand the interests and values that construct a technology in order to assess its impacts (Thomas 1999). The problem to identify and especially measure the consequences of computerization is a common theme in the evaluation literature (Willcocks 1992; Fitzgerald 1998; Walsham 1993; Bannister et al. 2001). The importance of acknowledging values as a

way of evaluating the impacts of computers is beginning to gain ground (Remenyi 2002).

This paper suggests an approach – actor sensitive evaluation – for assessing, and comparing, the values of computerization for different actor groups. The possibility to influence a technology is not equal among different groups of actors since some have more power than others. The purpose of this paper is to describe an analytical framework that can be used for assessing the value of IT for different actor groups by acknowledging the socio-political process (Walsham 1993) of computerization. Using a case study from Swedish home-help this paper validates the framework, although because of the limited form, and purpose, of this paper, the framework is illustrated by presenting how to analyse the values of only two actor groups– the politicians and the home-help assistants.

The paper is organised in nine sections. The following section describes the theory behind the work, and section three describes the research method. Section four gives a description of the case, while section five elaborates on the analytical framework of actor sensitive evaluation. Section six describes how to use the framework. The seventh section of the paper illustrates the framework in practice. The paper ends with a summary and conclusion.

2. THEORETICAL BACKGROUND

A workplace includes several conflicting ideologies where technology serves specific interests (Kling et al. 1980, p. 256), and in order to understand the effects of computerization we should study the computerization process' opposing forces as well as take a process view (Robey et al. 1999). Different actor groups have different interests and values (Danziger et al. 1982), which drive the organization as well as the process of computerization. Technology is a product of negotiation between various groups' interests, comprising to a higher or lesser degree various groups' desires and requirements (Latour 1991; Law 1992). A process of negotiation creates the artefact, and claims or facts are translated and strengthened or weakened through the enrolment of actors (humans or non-humans) (McMaster et al. 1998).

Actor groups, both within and outside the organization, perceive and influence the process of computerization according to their interests and values, and design and development of IT systems always involve moral value judgments (Klein et al. 2001, p. 81). This means that an IT system may not support all users. An artefact such as an IT system is inherently socio-technical, constructed by its sociological, economical, technical and political preconditions and surroundings. IT is not politically neutral (Winner 1999),

it comprises through its design certain values and in using a technology '*[…]we may be opting for far more – economically, politically, even culturally, as well as technically – than appears at first sight'* (MacKenzie et al. 1999). It is important to use an actor's perspective when trying to understand the impacts of computerization (Walsham 1993; Symons et al. 1988), as ideas play a performative role in the course of action (Latour 1996).

This work rests heavily on a social constructivist perspective in relation to technology (Latour 1987; Law 1992; Bijker 1995; Monteiro et al. 1995). The research objective for the technological constructivist is to describe technological development, not to be normative, offer value judgment, or determine whether a certain technology supports the interests of a specific group (Winner 1993). I feel that it is important, however, to acknowledge the consequences of IT systems, and analyse whether the introduction of a new technology supports the interests and values of certain groups on the expense of others. And to offer insights and explanations that may help us understand how IT can be developed and used to support, not only the strong, but also the weaker actor groups.

3. RESEARCH METHOD

Considering the nature of the research objective, with its focus on different actors' sense-making, and the underlying assumption that knowledge of reality is gained through social constructions, this study is classified as interpretive (Walsham 1993; Walsham 1995; Klein et al. 1999). This is also a critical study as the objective is to disclose what has been hidden and taken for granted (Kling et al. 2000). The critical comes into play when artifacts as IT-systems are analysed from multiple perspectives, and when the goals and beliefs of different groups are examined and critically analysed (ibid.).

The empirical data were collected through interviews, document analysis and observations. The following actor groups were interviewed: users (home-help assistants and section mangers), project leader for the IT/Change-project, system owner, IT system vendor and system administrator. The interviews focused questions such as reasons for computerization, the process of computerization, effects of computerization, and the actors' roles in the process.

The second type of empirical data, which has been very important, is historical records such as protocols from different political board meetings (1996-2001), documents directly linked to CareSys: contracts, system documentation, requirements specification, offers, etc., and reports from the

IT/Change project. (For reasons of confidentiality the documental records will not be listed in the reference list. But is available on request.) Statements related to the intended effects of computerization have in the analysis solely originated from documents, protocols dated from that time, since I wanted to minimize the time effect, and avoid problems such as poor recall, hindsight bias, and rationalizations.

I have also tested and evaluated CareSys in order to gain an understanding of the system (Hedström et al. 2002).

4. CARESYS – A SYSTEM FOR THE ADMINISTRATION OF ELDERLY CARE

This case is a reconstruction of a computerization process involving a standardized organizational wide IT system (henceforward called CareSys) for elderly care. CareSys was meant to replace as well as expand an earlier IT system, which mainly had been used for debiting purposes. Swedish local governments are responsible for providing high quality elderly care, and the service is regulated by law since home-help is an institutional right, and shall rest on values such as democracy, solidarity, emancipation, equality, and individuals' right to autonomy and integrity (Bergstrand 2001). The discussion to computerize elderly care in the local government began in 1994, the decision was taken in 1995, and CareSys was chosen in November of 1996. CareSys was finally implemented during 1998.

CareSys is a software package with modules for planning, carrying out and following up home-help. This system supports the home-help's administrative routines. The available modules for the users at the home-help unit are: "commission", "debiting", "living", "client", "others" and "staff". Every module is attached to a chain of sub-modules in a hierarchical fashion. A brochure issued by the company that distributes and develops CareSys describes the system in the following way (my translation):

> [CareSys] is a system created for supporting the daily work of administrators and managers in local government care [...] But not only is [CareSys] a system that meets the needs of an organization's daily tasks. Managers on different levels can through the system get access to current data for fol1owing-ups and evaluations. This increases the possibility to take part in the development of the organization.

The major official reason for purchasing a new IT system for elderly care was because the current administrating routines were deemed unsatisfactory, and a new IT system was seen as a way to solve problems of following-up

the economy and work (Project plan for implementing a new IT system for elderly care, 1996).

5. AN ANALYTICAL FRAMEWORK FOR ACTOR SENSITIVE EVALUATION

The analytical framework helps the analyser to focus on aspects that are important when we want to disclose, and analyse, the values that drive and is shaped by computerization. It shows how values are initiated, changed and created during the course of a change project. The framework helps identify and analyse the different actor groups' interests and values, thus acknowledging the power dimensions of social life. The framework consists of three parts: 1. computerization as a network with IT systems, work methods, and values and interests of different actor groups, 2. computerization as phases with intended and experienced effects, and 3. 'the due process model' that illustrates how enrolment and negotiation constructs an IT system.

5.1 From Idea to IT system

As the IT system is built, it changes from a project to an object (Latour 1996). The process of computerization is a process of negotiation, and the IT system is a product of compromises and adaptations (Law 1992). Computerization is illustrated as a network consisting of actors, IT systems, texts, other types of artefacts, work methods, and system development methods etc. (see Figure 1). Computerization includes the development, implementation, and use of IT systems (Iacono et al. 1996). The degree of materialization creates the shift from an idea (illustrated by a question mark) to an IT system (illustrated by a computer). In the beginning the new system is highly abstract, consisting of thoughts, sketchy ideas on paper, plans etc. During the computerization these ideas are put into a more concrete form as high-fi and low-fi prototypes, system presentations, etc., and the various actors' different views of the IT system will become more and more shared.

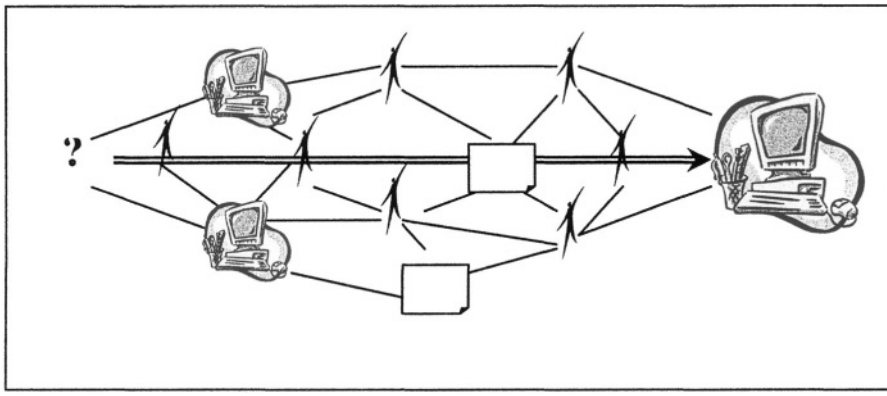

Figure 1. The Computerization Process as a Network

5.2 Intended and Experienced Effects

Benefits and effects are operationalizations of values. By identifying actor groups' intended and experienced effects in relation to the introduction of an IT system, we can identify and analyse the values of computerization. Although values are abstract and fuzzy, they are manifested in what people say and do (Rescher 1969, p 24), thus giving opportunity for research. Values determine and guide actions, feelings and beliefs (Mumford 1981, p. 27), thus representing directions that advance an actor group's interest (Lyytinen et al. 1987). Benefits or effects, not values, are often mentioned within the area of information systems. They are closely linked as benefits and effects are what seems to be a result of the realization of a value (Rescher 1969, p. 16).

Reconstruction of computerization can be done according to the phases planning, design, implementation, and use (see Figure 2), and it can be useful to use this delimitation for the evaluation process (Walsham, 1993, p. 176).

The reasons for computerization are transformed into *intended effects* (see Figure 2), which usually are associated with the use of IT as it is the desired future effects of computer use that is the reason for wanting to introduce a new IT system. The intended effects can be planned in the beginning of the project or emerge during the process of computerization, due to experiences of working with the project, as well as due to changes in the organization and the environment. The *effects experienced* are effects that actor groups experience from the computerization process, either from working in the project or from using IT.

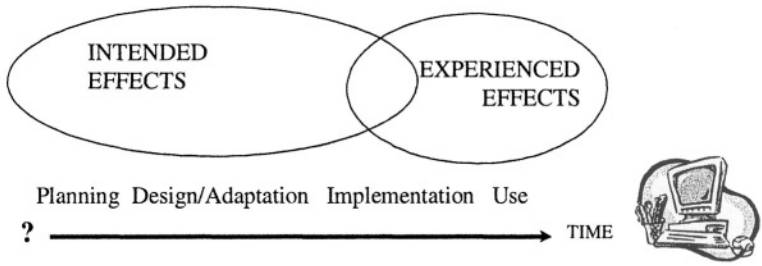

Figure 2. Reconstructed Computerization Process

Table 1 is an attempt to classify and analyse the experienced and intended effects of computerization. Focus for analysis is the realized and unrealized effects together with side effects.

The *unintended effects* are neither planned nor emergent, and effects that fail to be observed are named *effects not experienced.* Effects that are intended as well as experienced are the realized effects, and these can be either desirable or undesirable for a specific actor group (table 1). But the anticipated does not always happen, and so there are also unrealized effects. The unintended effects produce desired or undesired side effects. These effects are often related to other phases of computerization than computer use.

Table 1. A Framework for Analysing the Effects of Computerization

	Effects experienced	**Effects not experienced**
Intended effects (planned and emergent)	Realized effects - Desirable - Undesirable	Unrealized effects
Unintended effects	Experienced side effects - Desirable - Undesirable	

5.3 'The Due Process Model'

In an attempt to explain the realized and unrealized effects as well as describe the computerization process of CareSys I use a 'due process model' (Latour 1998, cited in McMaster, Vidgen & Wastell, 1998) that illustrates the process of how new 'candidates for existence' are, or fail to be,

developed into established facts and part of the institution (see Figure 3). This model helps to deconstruct the process of negotiation that constructs a new 'candidate' such as a claim, fact or technology. It describes how actors and other resources are enrolled in order to support the new candidate for existence. Realized effects illustrate when actors have managed to enrol other actors and resource in favour for a certain interest, while the unrealized effects illustrate when actors have failed to do so.

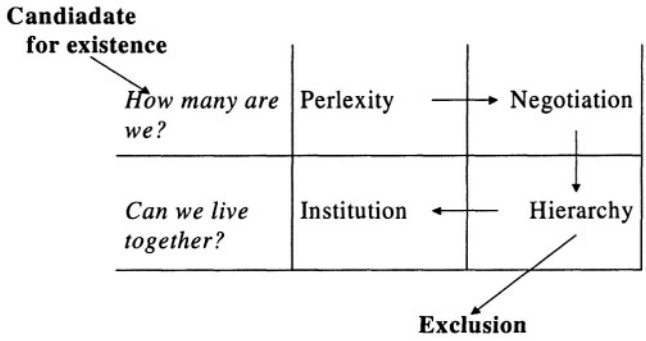

Figure 3. The Due Process Model (Latour 1998) (cited in McMaster, Vidgen & Wastell, 1998 and adapted by the author)

When a new claim, fact or technology enters the process, it increases the perplexity and confusion of the organization. The new 'candidate' is tested, probed, and negotiated by the organizational actors. It is assessed and valued by the different actors, who decide on exclusion or inclusion. Inclusion means that it becomes mutual – part of the institution – and made into an object, a fact, or technology different actors can agree on, whereas exclusion means that the 'candidate' is rejected. The excluded 'candidate' can later show up as a new 'candidate' for institutionalisation, adding to the continuation of the computerization process, and the establishment of e.g., a new IT system.

6. HOW TO CARRY OUT AN ACTOR SENSITIVE EVALUATION

The first step is to define the time frame of the computerization process. When should the analysis start and end? How long is the computerization process? Which actions are included? Which are the phases?

The second step is to identify the actor groups – that is any group of actors that influence or is influenced by the new technology. This is very important, as the purpose is to identify who drives the computerization process, thus embedding their values and interests in the new technology, and whom the new IT system supports. Data can be collected either by observing and following the process of computerization and the negotiation that takes place, or by reconstructing the history of adaptation and negotiation of an existing IT system. Irrespective of the chosen strategy, the focus of data collection and units of analysis are the actor groups and their different value statements, actions, and non-actions. These can be identified through document analysis, interviews, or observations. The different actor groups are identified, and grouped together, by their work tasks and work related goals (in line with Bijker 1995, and his notion of 'technological frames'). This illustrates the actor group's organizational position and relation to IT.

After categorizing the computerization process and identifying actor groups, the next step is to use table 1 to identify and compare intended and experienced effects held by each group of actors. These statements are ordered according to the time frame of the computerization process and each actor group. The intended effects can be related to each pre-use phase of the computerization process, or the analyser can choose to merge the pre-use phases into one that addresses the intended effects (see Figure 2). This makes it possible to disclose how various actor groups' interests and values have influenced, and also constructed the technology we evaluate, as well as through actors' choices and actions, how values attributed to the IT system change over time. 'The due process model' is applied to the data in order to further analyse the makings of an IT system and explain the realized and unrealized effects.

7. ANALYSIS OF THE COMPUTERIZATION PROCESS OF CARESYS

In order to try and further develop this approach to evaluation, I analysed the introduction of a new IT system within elderly care in a Swedish local

government. The computerization process resulted in the implementation of CareSys.

The computerization process can be said to begin in 1994 (see Figure 4) when the Social Democrats presented a private motion where they among other things suggested that *'[...] elderly care in our local government should be analysed in a thorough and scientific manner, thus resulting in ideas and action plans for care until the beginning of the 21st century'* (Private motion for the development of elderly care, 1994). A project plan for purchasing a new IT system for elderly care was presented in 1996 (Project plan for implementing a new IT system for elderly care, 1996). In November 1996 it was decided that CareSys was going to be the new IT support for elderly care (Purchase of CareSys, 1997). A contract was entered between the system owner (also the community care committee) and the contractor. CareSys was finally implemented during 1998.

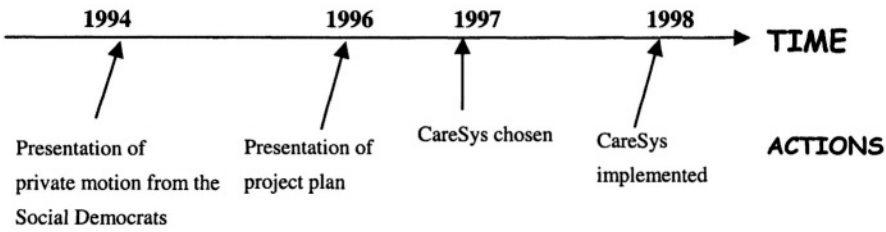

Figure 4. The Purchase of CareSys

This paper concentrates on two actor groups and how their interests and values have formed CareSys – the politicians and the home-help assistants. The reason for choosing the politicians is that they are a rather stable group and have been active throughout the computerization process. They are also very important actors as they are legislators and the ultimate decision makers of elderly care. The home-help assistants are included as they represent the users.

7.1 The Politicians

The politicians' goal is to guarantee that the citizens can influence decisions, and they work in order to advocate and secure equality, as well as guarantee that citizens' wishes and needs concerning good service is fulfilled (Goal and budget 1997, p. 20-21). They are responsible for elderly care in

the local government, thus framing norms, goals and allocating resources. The actor group of politicians includes the community of care committee, the production committee, and the executive committee. Statements from the politicians are expressed in official documents, which might not be consistent with a single actor's values, but they do, however, illustrate what the politicians as a group have considered important enough to put in writing, and, in some instances view as a 'correct' value statement. Figure 5 below lines politicians' different values attributed to CareSys in a time line. As can be seen from the figure, the values change over time, and that not all the intended effects were experienced.

The politicians initially focused on the future system's potentiality to improve administrative routines for time registration, debiting, and documentation (Summary of proposal submitted for consideration, 1996). It was also imperative to obtain a system that would facilitate following-up (Project plan for the implementation of a new IT system within elderly care, 1996), and support the work of the section managers (ibid.), as well as that the new system worked as an organizational wide IT support (e.g., Requirements specification, 1996). Later, when it was clear who the system vendor was going to be, more focus was put on the system as a support for section managers. The experienced effects shows that CareSys contributed to improved following-up and control, but failed to electronically integrate the elderly care organization. It also changed the section manager's responsibility concerning fees and rents.

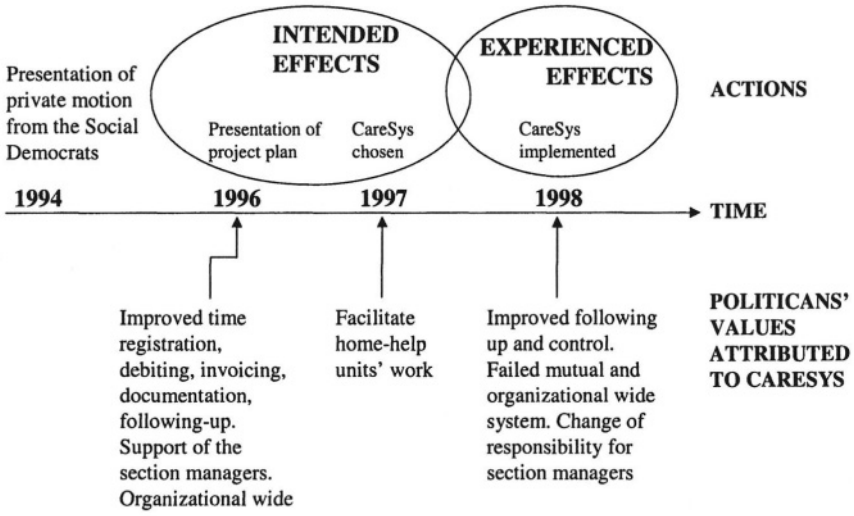

Figure 5. A Time Line Analysis of Values Attributed to CareSys

7.1.1 Realized Effects

One realized effect is the possibility for the community care committee to improve their control regarding registered time for the deliverance of home-help (Protocol, community care committee, 2001-12-13).

7.1.2 Unrealized Effects

The failure to connect the social welfare office to CareSys was a big setback, and decreased the possibility to live up to hopes of increased efficiency. The executive committee requested as late as 2002-03-21 the social welfare office to *'[...] secure data communication with CareSys'* (Protocol meeting executive committee, 2000-03-21). Another failure was the reluctance of the home-help professionals to use CareSys as an IT support for planning, and other care related activities (Interview, system owner, 2000).

7.1.3 Experienced Side Effects

During the implementation of CareSys in 1998, responsibility for fees and rents as well as subscription of leases changed. The section managers were now delegated this responsibility (Protocol meeting community care committee, 1998-02-19). Whether this change in responsibility was planned or not, is difficult to say, but it is clear that this change of responsibility coincides with the introduction of CareSys, and is not mentioned as an effect of the implementation of CareSys.

7.2 The Home-Help Assistants

The home-help assistants deliver care and use CareSys mainly for registering information on new clients, as well as supply and enter information for debiting purposes. The home-help assistants did not take part in specifying the requirements, and had thus no intended effects relating to CareSys. Therefore there is no point in doing a time line analysis of values attributed to CareSys for the home-help assistants, as they did not participate in the initial phases of computerization. But they did, naturally experience many effects from using CareSys.

7.2.1 Realized Effects

Invoices to clients are now more correct than earlier, resulting in less time needed to correct inaccurate information and answer clients' questions about billing.

7.2.2 Unrealized Effects

The politicians had hopes that CareSys would offer 'appropriate work support' for the home-help professionals, but CareSys is not used to support e.g., the nursing assistants' core activities, which is to assist the elderly in their life and daily routines.

7.2.3 Side Effects

The implementation of CareSys has resulted in increased organizational vulnerability as there are only a few people in each home-help unit who can use the system, and if they are ill or on vacation, there is no one to register the necessary information in their place.

The nursing assistants who use CareSys feel that their knowledge regarding the organisation, and particularly the process of invoicing has increased, They are proud of their changed role and increased competence regarding computer use and organisational issues. The implementation of CareSys has contributed to strengthen and change their role as nursing assistance.

7.3 The Establishment of CareSys as Negotiation

The politicians had several goals with CareSys. Initially they wanted to purchase a new IT system in order to improve administrative routines for invoicing, debiting, following-ups, and payment for home-help units, as well as e.g., planning for the section managers. The politicians initiated with these claims the computerization process. The community care committee was in a sense 'prisoners of the past' as they experienced their need for a new system in the light of the old debiting system, which had not worked well. Their claims were made based on their experience of using the old system, which had been developed for the area of childcare, and was not adapted for the needs of elderly care.

The social welfare office did not to exercise their right to comment the proposal for consideration regarding the purchase of a new IT system within elderly care, and choose therefore to not act on this issue (Summary of proposal submitted for consideration, 1996). It is clear that the politicians

felt that it is very important that the new system should be used by, and integrate, everyone working with elderly care, including the social welfare office. They hoped that this would 'simplify integration', become more cost- and time efficient, as well as increase the quality of care (Project plan for the implementation of a new IT system within elderly care, 1996). Even though the politicians repeatedly stated, as well as decided, that the social welfare office should set up data communication with CareSys, nothing happened. This shows that the action, or rather non-action, had consequences for the further work. It also raises questions about where the power lies, with the politicians, who have the formal power, or with the users, who by refusing to obey changed the whole process and also the outcome. It is evident that it was imperative to establish a data connection with the social welfare office in order to establish CareSys as an organizational wide system.

Although there are statements related to the interests and values of the home-help professionals, especially the section managers, they are always written after goals about CareSys' ability to support the needs of the community care committee, indicating that new IT system primarily was seen as an IT support for the community care committee. And it was also the community care committee's interests and values that had strongest impact on the computerization process. The interests and values of the home-help assistants were not at all related to in the document I reviewed, which means that this group has had little or no impact on the process of computerization. The interests and values of the community care committee were also related to in the contract where the contracted adaptation of CareSys is almost solely devoted to matters related to the needs of the community care committee. This clearly illustrates that when users do not or cannot take part early in the computerization process, before the "idea" becomes an IT system, it is very difficult to exercise any genuine power or influence.

In 1997 the politicians restated that it was important that the new system facilitated the work of the home-help professionals, but as before this statement comes second after the needs of the community care committee's:

> The community care committee is primarily interested in CareSys in order to secure satisfactory routines for debiting of fees, basement for payment to care units, and following-ups of care carried out. The system will also include additional functions that offer the home-help professionals appropriate IT support, which in the long run should facilitate their work considerably. (Purchase of CareSys, 1997)

The above statement occurred at the same time as the system vendor entered the process, and the vendors tried to enrol the politicians by stating that CareSys also supported the work of the home-help professionals. But the home-help assistants only use the system for registering and entering

data, which is not surprising, as CareSys is not tailored after the interests and values of the home-help assistants.

8. SUMMARY

This paper presented a framework that can be used to analyse the values of the computerization process. In order to further illustrate its use and usability, I have applied the framework to a case study and the presentation in this paper focused two actor groups and how they by their actions, or non-actions, have contributed to the construction of CareSys.

The politicians' values and interests were embedded in the system development process through a number of actions. The politicians', e.g., the community care committee, initial goals had a strong impact on the whole systems development process, thus putting most focus and effort on making sure that administrative routines concerning debiting and invoicing worked and were adapted to the needs of the community care committee. CareSys is, thus, used mostly for debiting and invoicing. CareSys failed, unfortunately in more ways than one, to become the organizational wide system it was intended to be. One reason could be that the initiative to purchase CareSys was taken and driven by the community care committee, with not enough consideration to the interests and values of the system users. They also failed to include the social welfare office, who even chose not to comment on the proposal for consideration, thus trying to obstruct and hinder the purchase of CareSys.

The home-help assistants did not take part in the creation of CareSys, but experienced CareSys as a means for increasing their organisational knowledge. As the home-help assistants entered data using CareSys, information for debiting was more correct than earlier, thus decreasing the time needed for correcting invoices.

9. CONCLUSION

By disclosing the historical process of adaptation, is it possible to show how various actors influence and thus shape the IT system. The negotiation of constructing an IT system is in this way illustrated and made visible, showing how different actor groups' interests and values have shaped the process of computerization, and thus also the IT system *per. se.* This knowledge helps us understand and analyse actors' experienced effects, which makes it possible to learn from project to project. The actor sensitive evaluation, which acknowledges the social and political character of

computerization, gives us an instrument that can help us critically examine the values of computerization, and uncover who benefits from the introduction of new computerized information systems.

The analysis has shown that the initial interests and values that go into the process to a great extent decides how the IT system is used, and experienced. If a specific group shall use an IT system, their values and interests must early on influence the computerization process. But it has also shown that a refusal to act is a strong way to influence the computerization process, and that the power to use an IT system ultimately lies with the users. This conclusion challenges Danziger et al.'s statement that IT systems may reinforce *'[...] the power and influence of those actors and groups who already have the most resources and power in the organization'* (Danziger et al. 1982, p. 19). The analysis is also an illustration of how artefacts are socially constructed, and that technology does not have any power of their own, no inner inertia that disseminates the new technology. That it is the actors who, by their actions develop and disseminates the artefact. The analytical framework of actor sensitive evaluation, with the view on computerization as negotiation of different interests, clearly illustrates the importance to include users early in the design process, before the idea of an IT system has become the object "IT system", when it is much harder to influence and change the design. The users need to be part of the computerization process before the IT system has stabilized and become a "black box" (Bijker 1995; Latour 1986). A participatory design approach (Beck 2002) is therefore necessary in order to create an IT system appropriate for as many users as possible.

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Chapter 2

INFORMATION AND COMMUNICATION TECHNOLOGIES DIFFUSION IN INDUSTRIAL DISTRICTS

An Interpretive Approach

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Abstract: The research presented in this paper reviews the diffusion of network technologies in the Italian industrial districts by applying an interpretive process framework. We describe the social process and the context that characterize the district as a peculiar socio-economic reality. On this background we discuss two surveys carried on during last three years in twelve Italian industrial districts concerning the diffusion of Information and Communication Technologies (ICTs). The surveys document the widespread diffusion of ICTs that support communication flows and infrastructure such as email and ISDN and ASDL connections whereas technologies that have an impact on the business models like ERP systems and e-commerce applications are less diffused. We elaborate on these findings and argue that the different trends in diffusion depend both on technological/economic reasons and socio-cultural issues. On one hand district firms hold low technical expertise and cannot afford high costs technologies; on the other hand they perceive ICTs as an inadequate substitute to the rich network of relationships they have already built up during decades of interactions. In this context the special role of the local institutions in the process of sustaining the diffusion of the innovations will also be examined

Key words: Industrial District, Information and Communication Technologies (ICTs) diffusion, interpretive approach.

1. INTRODUCTION

With the introduction of network technologies and the globalisation of markets, the business model of small and medium enterprises (SMEs) is developing within the ambit of a global competition scenario that involves new opportunities and challenges. Information and communication technologies constitute an efficient means through which it is possible to improve communication flows and increase the creation and sharing of knowledge among firms.

In the Italian industrial scenario, the industrial district (ID) constitutes a peculiar model of production deeply rooted on the social context. As a matter of fact, the district is a socio-territorial entity which is characterised by the active presence of both a community of people and a group of firms in a naturally and historically delimited area (Becattini, 1990). Therefore, the territory represents not only a whole of physical factors but mostly a socio-economical and cultural environment, which becomes a necessary infrastructure of communication upon which district relations are based (Micelli and Di Maria, 2000). Empirical evidence has shown that district firms are not capable of fully exploiting the advantages and opportunities offered by network technologies that are geared towards supporting their competitive advantages and increasing their resources' value (Micelli and Di Maria, 2000).

Data published by RUR/Censis' study for Federcomin and the TeDIS[1] Observatory in last years show that district firms have not adopted—at least not more than in a marginal manner—the so called "project technologies" that is the most advanced or complex technologies from the point of view of networking, while they have internalised the *easiest* technologies such as e-mail or the web site. Furthermore, the research highlights the lack of a common strategy among district firms in the adoption of new technologies.

This paper intends to illustrate the present situation of the diffusion of network technologies in the Italian industrial districts under the interpretive process framework proposed by Walsham (1993), highlighting the challenges and opportunities offered by new technologies to district firms in terms of facilities regarding communication, business processes and knowledge sharing.

Within the huge amount of literature on innovations in organisations we are particularly interested in the framework developed by Walsham (1993)

[1] Federcomin is the national federation of enterprises operating in telecommunication and information technology sectors.

TeDIS is the Center for Studies on **T**echnologies in **D**istributed **I**ntelligence **S**ystems of the Venice International University (Italy)

to understand the relationship between organisational change and information systems. His work had been commented and integrated in a broader frame by Slappendale (1996) who distinguishes between an individualist, a structuralist and a so-called, interactive process perspective on innovations in organisations.

This third perspective had been introduced to the field of information systems development and use by Walsham (1993) and comprises the first two by emphasising the context, content and process of innovative change in organisations. It appealed to us as it, to overcome the shortcomings of other highly linear and rational models, proposes to perform the analysis of change in terms of a constant interplay of its three constituting elements over time.

In this paper we will use this framework to understand the diffusion of innovation at inter-organisational level, within Italian industrial districts. Walsham's approach had already been used by one of the authors both at organisational (Kautz, 1996) and inter-organisational (Kautz and Henriksen, 2002) levels to explain respectively the introduction of a technical artefact, namely an electronic mail system, into an organisation and the diffusion of EDI in the steel and machinery industry in Denmark.

2. THE INTERPRETIVE PROCESS APPROACH TO INNOVATION DIFFUSION

Research on innovations in organisations has been carried out with a focus on different levels of analysis, and as a consequence with differing, partly contradicting results. Slappendale (1996) has performed a comprehensive literature review and provides a framework which distinguishes the existing work in the field in three categories based on the applied perspective on innovative organisational change, namely an individualist, a structuralist and an interactive process perspective. The three perspectives can – following Slappendale (1996) – be described in terms of their basic assumptions about who and what causes innovations, and what the accompanying core concepts in such descriptions are.

Both in the individualist and the structuralist perspective innovations are seen as static objects or practices, which are, respectively, can be described objectively. The process of innovation, irrespective of whether the innovation is caused by individuals or determined by structural, organisational characteristics follows simple linear stages typically denoted as periods of design and development, followed by adoption and implementation, and finally diffusion. Both perspectives largely focus on the adoption phase, the phase where the decision is made to invest resources to accommodate implementation of the innovation (Cooper & Zmud, 1990).

The interactive process perspective assumes that innovation is a dynamic, continuous phenomenon of change over time in which various factors have mutual impact on each other. As the actions of innovative individuals cannot be divorced neither from the activities of other individuals nor from the organisational structures within which they operate, innovation is the result of constant_interaction of the actions of individuals, structural influences and the innovation itself.

This approach had been proposed and developed in a comprehensive way by Walsham (1993) when studying change in the context of information system development and use by utilising the concepts of content (of innovation), the social process (of innovation) and the social context (of innovation) as inter-linked units of analysis.

We follow Walsham's approach and utilise those concepts for our investigation of Information and Communication Technologies diffusion within industrial districts.

In such a perspective the content of an innovation, be it a product or a process, is perceived subjectively and is subject to ongoing reinvention and reconfiguration.

The context of an innovation is explicitly understood as a wider social context comprising both social relations and social infrastructure in and outside the unit of analysis, which allow initial ideas to proliferate into several ideas and innovations as the process ensues. This also comprises the historical circumstances from which an innovation emerges. Here quite regularly shocks to which the organisation is exposed can be traced as the origin of an innovation. The social context, f. ex. in terms of a combination of motivational factors and individual competence, is also considered to have an influence on an organisation's innovative capacity as a whole.

Finally, innovation as a social process is characterised by politics concerning the distribution of power and the control and autonomy of the individuals involved and their culture, subcultures and interactions between different stakeholder groups and subcultures play a significant role as well. As such innovation is a complex, messy process, which is inseparable from its broader context. It should therefore be analysed and understood in terms of the continuous interplay of content, process, and context of change.

3. THE SOCIAL PROCESS OF THE INNOVATION

In order to better understand the social embeddedness of the innovation diffusion process and its social dynamics within Italian IDs, we need to highlight the main features of this industrial reality.

It is difficult to propose a model of the Italian district reality given the variety of organisational and relational forms that exist in the diverse districts present in the territory. However it is possible to single out some salient features that have characterised the districts since their phase of development in the seventies.

From a relational point of view, and according to the 'Marshallian' classic model, one can evince many of the distinctive traits of the industrial district as a model of the socio-economic organisation (Marshall, 1952; Becattini, 1989; 1990; Biggiero, 1998, 1999; Lipparini and Lomi, 1996; Trigilia, 1990). The industrial district is defined as "a socio-territorial entity which is characterised by the active presence of both a community of individuals and a population of firms in a naturally and historically bounded area" (Becattini, 1990, p.39). Particularly, the expression "community of individuals" makes explicit reference to the internal social structure of the district. Such structure is reinforced by a homogeneous system of values diffused within the district, invigorated by daily interaction and transmitted from generation to generation thanks to a "system of institutions and rules" (*ibid.*) – firms, spread families, technical schools, churches, political parties, etc.. The expression "population of firms," instead, regards the economic aspects of the district's reality and identifies a spatial concentration of numerous small and medium firms in a geographically delimited area (Paniccia, 1998).

The salient traits of the district structure are mainly caused by the territorial localisation that characterises the district itself: the fact of living in an area which is naturally and historically bounded has led to development, and it is, in turn, a product of a common culture, a sharing of codes and values that is reinforced by continuous interaction over time. The expectations of interaction repeated in time and space also favour the creation of mechanisms of identification of the firms with the district (Sammarra, 2000; Sammarra and Biggiero, 2001) which constitute a fundamental antecedent for the dynamics of co-operation, reciprocity and trust that characterise the relations between the firms within the district.

Inside the ID, Biggiero (1999) identifies three levels of multidimensional patterns of interaction: at the first level, we find networks of individuals and of groups of individuals that constitute the firm. They are tied together by asymmetric relationships (hierarchy) and symmetric ones (co-operation). The second level of interaction is composed by SMEs – that are the most part of district firms – and by leading firms – that can be multinationals or bigger sized firms or innovative SMEs. Those firms are connected through formal and informal relationships of co-operation and competition and they often build up consortia, entrepreneurial associations or district committees. The third level of interaction is individuated in relationships that occur

among these firms and associative structures on one side and the local institutions – such as municipalities, provincial and regional governmental institutions, schools and universities, banks or other financial service providers – on the other side. The multidimensionality of those networks resides in the different layers on which relationships occur. Indeed all the actors listed above interact each other at economic, social, cognitive and symbolic level, by creating dense and recursive patterns of interaction.

IDs are thus a clear example of Triple Helix evolution (Biggiero, 1998; Leydesdorff, 2001) on a geographical basis where universities, firms and local institutions are the main actors involved. In Italy they have suffered from the under-development of the academic sector, hindered by its own inertia and largely insensitive to the needs and behaviour of SMEs. The weakness of university-industry interaction is also due to the lack of interest shown by first-generation entrepreneurs of SMEs that were the very "self-made men". With the natural generational change, the situation seems to improve, even if also the institutions-industry relationship remains still weak with respect to its potentiality.

The main mechanisms for learning, knowledge and innovation diffusion in the industrial district thus include: interrelationships between suppliers and customers and the makers and users of capital equipment; formal and informal collaborative and other links between firms in particular sectors; inter-firm mobility of workers in localized markets for high skill; and the spin-off of new firms from existing firms, universities and public sector research laboratories. Labour mobility and new firms' spin-offs transfer knowledge once and for all and/or serve to establish an ongoing link between the firms and with research institutions via the maintenance of personal relationship. More on-off district effects include imitation, emulation and reverse engineering but, in this case, proximity is more important than sustained interaction and enduring relationships.

Capello (1999) has provided a schema of the emergence of the innovation diffusion capacity by listing the preconditions for the various stages of development. Specialized areas emerge from simple geographical proximity with the growth of stable inter-SME linkages and the establishment of a local labour market for the required skills. These provide continuity over time for local technological and scientific know-how. Industrial districts develop from specialized areas as close social interaction and supportive institutions generate high trust and encourage informal and tacit knowledge transfers. This leads to an industrial atmosphere, external economies and savings in transaction costs. From cooperative relations and the free flow of knowledge, synergies and innovative capacity evolve and the industrial district develops its ability to innovate. Moreover the strength and the recursivity of the social network of relationships facilitate the

emergence of the social learning phenomenon (Bandura, 1977; Wood and Bandura, 1989) according to which «Diffusion models portray society as a huge learning system where individuals are continually behaving and making decisions through time but not independently of one another....Everyone makes his own decision, not just on the basis of his own individual experiences, but to a large extent on the basis of the observed or talked about experiences of others» (Hamblin et al., 1979).

4. THE SOCIAL CONTEXT OF THE INNOVATION

From a structural point of view, the industrial district can be considered as a network of institutions, associations and small and medium enterprises located in a determined geographical area and normally characterised by a high capability for innovation and self-organisation (Biggiero, 1998). This definition particularly underlines the dimensional aspect of district firms, which are closely interconnected among themselves through vertical and horizontal networks. The district itself as a whole can be considered as a hyper-network, composed of a network of other networks (Biggiero, 1999) that tie the firms between themselves and to the institutions (public bodies, professional associations, trade unions, etc.).

The economic environment of a district as a "population of firms" (Becattini, 1990) geographically adjacent also presents peculiar features. First, within the district a radical fragmentation of the value chain takes place. Brusco (1990) underlines that generally, there is a vertical division of work rather than a horizontal, which favours the appearance of peculiar dynamics such as a vertical co-operation joined with a horizontal competition although the latter is also characterised by the main common interest, that is, the survival of the district. In this kind of environment, the fact that the division of work between firms prevails over the division of work within the single firm reinforces the reciprocal interdependence of organisations and favours the perception of the local industry's peculiarities, and particularly, of the human capital, which is requested and developed as if it were common property. This also favours the expectations of long time collaborations between district firms and therefore a reduction of opportunistic behaviours. Second, the fragmentation of the productive system leads to a high degree of specialisation in the single phases of production and to high flexibility and capability of adjustment to the market's requests (Piore and Sabel, 1984), which has determined the success of the district model in the Italian economy in the latest few decades.

Another important feature of the Italian district model is the manner in which districts create, accumulate and spread knowledge (Becattini and

Rullani, 1993; Corno, Reinmoeller and Nonaka, 1999). Most of the knowledge that circulates within the districts has a tacit nature, deeply tied to the experience of individuals that are in the centre of the production dynamics (Micelli, 2000). Therefore one can talk about contextual knowledge (Belussi, 2000; Amin and Cohendet, 1999) meaning the collective result of a slow process of knowledge creation, experimentation, know-how, interpretation and transposition of abstract knowledge. This type of knowledge develops from the continuous interaction in the work place, from repetitively carrying out the same activities over time and from facing the same environmental complexities. Consequently, firms are deeply rooted on the territory and the territory supplies, in this context, a real self communicative infrastructure since it puts together a whole of specific languages and local culture that constitutes the base of the district (Micelli, 2000).

In this paper, we comment on data drawn from two different surveys made in last few years on network technologies diffusion inside Italian IDs. The first one is a longitudinal analysis carried out by the TeDIS Research Centre of the Venice International University on data collected from 1999 to 2001 (Chiarvesio, 2002). This survey has involved 210 firms located in 12 different industrial districts belonging to the Italian regions that are most characterised by this model of economic development: the North East, Lombardy, Emilia Romagna, Piedmont, Tuscany and Marche. The districts have been selected among the three most significant "made in Italy" fields: fashion, house furnishing and mechanical design and installation. The most part of the firms in the sample are medium-sized enterprises (i.e. average sales of 20 million euros per year and less than 100 employees) that produce both for the market with their own brand (62,8%) and for other firms inside and outside the district (as components producers or subcontractors).

The second survey we comment upon had been carried on by RUR/Censis for the Federcomin. It focuses on digital districts and examines 51 consolidated and emerging districts spread all over the country and makes a slightly different analysis in respect to the one made by the TeDIS Observatory. It focuses on the presence of common initiatives organised by district firms to constitute a real self-organising digital district comparable to the virtual marketplaces. Data from this study are partly different than the TeDIS ones, perhaps due to the inclusion of districts recently created and located in the South of Italy that reflect a tendency to be less familiar with technical innovation if compared to the national average. In this survey data had been collected through a questionnaire submitted to a panel of key figures from the different districts.

Data drawn from the TeDIS survey confirm district firms' tendency to export: over 40% of the contacted firms exports at least half of the turnover

for the foreign markets and less than 5% operate solely for the national market, while all the firms declare to have established collaborative relations with their customers and suppliers. In such a scenario, the data that regard the adoption of network technologies appear to be a little counter intuitive in the sense that collaborative technologies that favour inter-firm relations are the least diffused. As a matter of fact, the most complex instruments, those that involve high investments and a clear projection, such as ERP, videoconferences, EDI and groupware have still not been widely adopted, although there are substantial differences if one analyses data in terms of activity sectors. In the mechanical sector, for instance, this kind of "project" technologies are more consistently adopted but this is a logical result considering that the activity is tied to big customers, mostly in the automobile and white domestic appliances sectors.

5. THE CONTENT OF THE INNOVATION

The diffusion of new technologies, generically grouped under the label of information and communication technologies (ICTs), has brought about the necessity for an overall revision of business models, not only for big firms, but also for small and medium ones, to be able to handle the market globalisation and thus to face global competition rather than local. Technologies make an impact on both the business processes and the communication flows and they tend to tear down geographic boundaries and to eliminate the confines of the organisations with regard to choosing solutions such as integrated value chains between providers and customers or virtual organisations. This heterogeneity of possible solutions involves an infinite variety of technologies, including e-mail, web sites, ERP systems, EDI protocols as well as intranet and vertical and horizontal portals. The common aim of these technological solutions is to offer support to the development of distributed business models and to the reticulation of organisations both internally and with competitors or partners.

Data gathered by the TeDIS survey (Chiarvesio, 2002) have shown a slow but continuous increase in the diffusion of the technological infrastructures inside the studied firms: a large number of firms (from 44,4% in 1999 to 60,9% in 2001) actually uses personal computers not only for managerial and administrative tasks but also for production flow management.

The same trend can be seen in the information systems expenses during the observed period: in 2001 more than 20% of the firms in the sample used more than 2% of their revenues for IS assets (whereas in 1999 this percentage was around 5%).

Table 1. Network Technologies Diffusion in Italian IDs (%)

Technologies	*1999*	*2000*	*2001*
e-mail	82,1	96,6	98,6
ISDN	68,6	87,9	88,9
website	67,6	83,6	84,1
ERP	8,2	19,8	28,5
ADSL	0	0	15,5
Groupware	10,6	15	15
EDI	9,2	9,7	13
Videoconferencing	8,2	7,2	9,7
E-commerce	0,5	0	4,3

Source : Chiarvesio (2002)

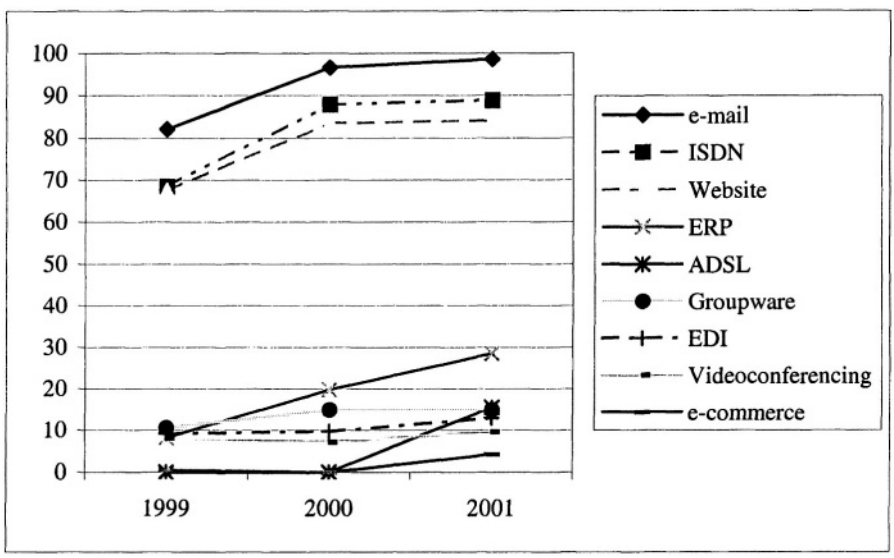

Figure 1. Network technologies diffusion in Italian IDs – Source : Chiarvesio (2002)

More specifically and in detail, Table 1 shows the adoption percentages for network technologies and supporting infrastructures (such as ISDN and ADSL connections) during the observed periods and the graphical presentation of the data in graphic 1 shows the emergence of the classical S-shaped Rogers' curves (1995) of innovation diffusion for most of the technologies under analysis. The most interesting issue is the intensity and the differences in the diffusion rates among different technologies. It clearly emerges that a great difference still exists among 'commodity' technologies such as e-mail, static- information providing only – websites and 'project' technologies like ERP, groupware, EDI, video conferencing, and e-

commerce[2] (Chiarvesio and Micelli, 2000). Among the latter, only ERP systems show a constant increase in their diffusion and it represents a countertendency with respect to other similar technologies. Those latter indeed, show ambiguous diffusion trends along the three years and don't have reached the same diffusion rates than ERP systems. Data also show that almost all firms in the sample have multiple email addresses, and data on the usage of email confirm that they use it both for internal and external communication (i.e. among firm's internal offices and with business partners, customers and suppliers).

Furthermore, almost all the firms in the sample have fast ISDN connection and in 2001 ADSL connections have shown a steep increase in the diffusion rate (from 0 % in 2000 to 15,5 % in 2001).

Also web sites, in the form described above, achieve such a diffusion rate (84,1% in 2001) that they have already become a commodity. As a qualitative survey on website use confirms, the functions offered by the website are not fully exploited by district firms: in 2001 only 5,2% of the firms make on-line sales, e-commerce functions available. If web sites are unanimously considered as a new and important tool to interact with the market and the customers – all the firms that hold a website use it as a shop-window to present themselves and to give information about their products, and they are trusted for functions such as the collection of information (24,8% in 2001) and relations with the value chain (60,1% in 2001 presents catalogues online), e-commerce is instead considered not apt for the specificity of the firms and the kind of products they make (Muzzi, 2002).

The reluctance to adopt e-commerce is easy to explain if one considers the peculiarities of district firms: small and medium firms that have developed highly specialised competencies and have built their own competitive advantage upon flexibility and their capability of product customisation, establishing close contacts with the customer. Through e-commerce the direct contact with the customer is in a great part lost and thus also part of the added value that the district firm contributes to the product/service it offers.

Generally speaking, the Federcomin data confirm a broad e-mail diffusion in 59% of the local systems of production, the presence of web sites in companies in 30% of the districts and the wide-ranging existence of shopping window web portals both in and for the firms and the population of the territory as such.

[2] E-commerce solutions are defined here in accordance with the European Commission report (1998) as varying from a homepage with online catalogues as a window for the firm's products to the complete substitution of the traditional purchase function with an online one and, finally, the management of all the sales and purchase transactions online.

A particularly significant point in the Federcomin Report is the fact that in only 4% of the districts, the existence of a common strategy towards the digitalisation of the districts is perceived. In the rest of cases, there exist isolated, individual initiatives brought forth by single firms that create a scattered diffusion of technologies.

6. DISCUSSION AND CONCLUSION

Data from the studies presented lead to a series of reflections about the relation between districts and network technologies: on the one side, there is an increasing interest towards new technologies, although, at present, mainly to facilitate communications. It can however be argued the real added value offered by networked technologies to district SMEs will be verified only when those technologies will become a support to their business model. At the moment, however, the road is still long, as demonstrated by the very different trends observed in the diffusion of 'commodity' technologies and of project technologies. The diffusion of the latter kind of technologies is still not in a majority stage and indeed the Rogers' S-shaped curve (1995) has emerged only in analysing the easiest kind of technologies with the only exception of ERP systems where, as well, the quantitative score of diffusion is still limited. We have thus to cope with a two-mode diffusion model that strongly depends on the content of the innovation itself: on one side technologies for facilitating communications are widely diffused whereas more business-oriented technologies encounter serious obstacles to diffusion. This duality is also based upon the different attitudes towards the innovation: The data supported that a widespread mistrust characterises Italian district firms – reinforced by the flop of the so-called 'new economy' in 2001 – they seem to prefer not to risk heavy investments and to adopt cheaper, less far reaching, 'softer' solutions.

Moreover, as empirical evidence suggests, the adoption of new technologies by district firms is in an early stage, that is, the firms are at the beginning of the innovation decision process (Rogers, 1995; Karahanna et al., 1999) and they are evaluating cost and benefits of adopting new technologies. The firms are in the very sensitive phase of forming their attitudes and beliefs towards the introduction of the network technology innovations in their business activities.

The TeDIS survey has highlighted the preliminary cost/benefit analyses made by 'pioneer' firms in adopting ICTs: They have decided to implement a website mainly for non-economic reasons. Indeed 61,9 % of the adopter firms in 2001 declared that the website allowed them for a better interaction with their customers and facilitated getting feedback from them. The firms

limit their activity on the web still to rudimentary online catalogues and customers' support, so it doesn't affect directly their economic situation or their productivity. The main benefits they declared to get are about organisational identity and status versus competitors that have still not implemented any website. Thus, the evidence of Italian IDs confirms Klongan and Coward's (1970) hypothesis that sociological variables may be more important in explaining mental acceptance of innovation, whereas economic variables may be more important in explaining the use of innovation.

Within IDs, social, historical and cultural background have a strong impact on the firms' inertia in adopting new technologies, and the economic evaluation of this issue appears not to be so relevant at this stage of scarce diffusion and preliminary assessment of ICTs impacts. These conclusions are supported by the evidence that the more firms invest in complex technologies the more they perceive economical benefits and the more they are willing to make further investments in information technologies (Chiarvesio, 2002). It means that for those firms that have still not adopted complex network technologies the main obstacle to the adoption has not an economic foundation but a social and cognitive one: As argued earlier they do not trust enough new technologies for deciding to invest in them.

Two main reasons can be identified in order to explain this inertia towards innovation within IDs: first district firms show a strong will to keep the relational social and economic structure alive, which has marked their success through the years, but this position leads to certain rigidity in defining the demand side of technological products and services. The way transactions are managed within the district is usually very informal and orally confirmed: few formal agreements are signed among trading partners and the flexibility in fitting market's requests is often achieved by redistributing customers' orders to friends or colleagues when one's productive capability is exhausted. A similar way to behave and to manage business relationships is incompatible with most IT systems and thus, paradoxically, the willingness to remain flexible on the district companies' side leads them to be firm and rigid in rejecting to mould their relational structure to fit with ICTs' requirements. From the districts' perspective the introduction of new technologies leads to a discontinuity of the established business model as an effect of the new available tools, and this tendency collides with the firms' strong will to maintain the business model unchanged that has been successful to date.

From a cognitive point of view, this situation is fully coherent with Gioia's (1986) statement about the rigidity of actors' mental models especially if those models have successfully been applied in order to interpret the real world for decades.

As Weick (1990) points out actors' attitudes towards new technologies' adoption strongly depend on the comparison between actors' mental model about the 'right' way to perform their work and the actors' mental model on how information technologies will allow them performing the work in a new way. If these models are divergent, as they appear to be within IDs, the inertia to change emerges.

Furthermore, the prospective of computerisation reasonably involves investments for projects of radical type, while district SMEs show a predilection for changes, and therefore investments, of incremental type. Also the focus is different. The information systems focus a great deal on transactions and emphasise the technological integration while the crucial point for districts is the maintenance of an interactive and dynamic communication model such as face-to-face with much attention to the contents of communication itself. After having underestimated for long the specificity of the Italian productive context, the technology providers have started to propose tailored 'ad hoc' solutions not coming from the downsizing of packets developed for big firms, but based on studies to specifically meet the requests of a more exigent and concrete demand. The first result of this new attention to SMEs needs is the growing diffusion of ERP solutions in almost all the different sectors under investigation. Technology providers and SMEs themselves have started to pay greater attention to internal process reconfiguration in order to deal with the actual competitive challenges on the market: globalisation, quality standards, time-to-market, variety and differentiation of the production. With the adoption of those technologies and thus through a more structured management of the information flows, SMEs are now able to look for costs lowering and offering a higher level of support to customers. Furthermore with the internationalisation of the market, the openness of the supplier/buyer relationships and the delocalisation of the production processes, firms within IDs now need to supply themselves with integrated solutions for managing distributed information. For these reasons a convergent process both on the demand and supply side has begun and it is realistic to expect a slow but continuous increase in the diffusion of integrated managerial tools.

Second, the data collected by RUR/Censis (2001) show that the introduction of new technologies with regard to integration at district level brings into light a problem that has always been present in the Italian districts: the balance between competition and co-operation (Staber, 1998). In 52% of the local systems it is hard to share information and competencies and firms fear, if they introduce shared technologies, to loose their autonomy in the management of their own business, which is considered to be necessary to preserve the flexibility that characterises the district productive model. The new technologies are then considered as factors that can upset

the regular competitive relationships within the district reducing advantages of the firms. The use of common technological platforms and the sharing of information represent a problem not only because these could be advantageous for the competitors, but also because the firm would risk losing its own managerial autonomy, transferring it to hetero-direct working models (RUR/Censis, 2001) imposed by the technological platform, f. ex. by outsourcing the IS function and thus being also dependant on the provider's decisions or, in the worst case, by strong competitors or providers and customers that may impose organisational changes. Therefore, the choice to start common initiatives where the normal co-operative dynamics within the district are not enough depends mainly on the presence of a strong firm in the territory that operates with a district logic or that strongly and explicitly depends on the commitment of part of the local institutions which work as catalysts and promoters of the innovation itself. This solution refers to a model of evolution in the districts that locates the engine of development and innovation in the role of the leading firm (Corò and Grandinetti, 1999). This field of research investigates how 'endogenous and hermetic' communities (Lazerson and Lorenzoni, 1999, p.362), that are apparently closed to new ideas and information, such as the industrial districts from the classic point of view, can avoid economic breakdown. According to Boari and Lipparini (1999) the enterprises within the district are heterogeneous and not interchangeable in terms of roles and duties (Lipparini, 1995); some firms build and manage wide and differentiated relation networks with other firms (Lorenzoni and Baden Fuller, 1995) and the district is mainly seen as the product of the dissemination of technologies and knowledge of bigger firms (Lazerson and Lorenzoni, 1999). In order to push ahead the innovation diffusion process local institutions and leading firms could enhance the social communication of the perceived benefits of new technologies. Indeed while each innovation can be considered as an instance of interaction among different actors in a socio-economic systems, as IDs are, it would be necessary to allow for the creation of an innovation system (Leydesdorff, 2001) that has to be built recursively on the interaction terms. This means that a continuous interplay among different local actors might support the collective learning pattern that may lead to the strengthening of the triple helix of University-Industry-Government relations (Leydesdorff, 2001; Biggiero, 1998).

The role of institutions is central also to tackle another problem that emerges from the RUR/Censis study: the difficulty of finding qualified human resources, which is a serious obstacle for the development of innovation. Skill shortage is a relevant problem in the industrial districts, but it seems that firms are not disposed to take responsibility for training; in

such a context the role of institutions becomes fundamentally important to cover for this lack.

The distrust shown by district firms towards the adoption of new technologies also leads us to reflect about problems regarding the possibility of transferring the contextual knowledge onto a technological platforms, that is the attempt to codify it, since such knowledge, as some authors have highlighted (Belussi 2000; Amin and Cohendet, 1999), is the main resource for generating innovation within the districts. It is evident that knowledge that flows through information and communication technologies is explicit and codified (Nonaka and Takeuchi, 1995; Howells, 1996; Borghoff and Pareschi 1997; McDermott, 1999; Johannessen et al., 2001): it is information that is then "decodified" and interpreted through the cognitive structures of the diverse receivers (Bolisani and Scarso, 1999) to finally flow into their knowledge background. But the situation becomes more complicated if the knowledge to be shared is tacit, like contextual knowledge, deeply tied to the territory in which it is produced and exchanged and to the relational context on which it leans. These types of limits of the technologies are likely to emerge if one reasons in terms of manners and means through which this type of knowledge is transmitted (Muzzi and Dandi, 2001, Kautz and Thaysen, 2001). The main knowledge transmission mechanisms within the districts are the informal communications between experts and people who are familiar with such knowledge from working with it, the mobility of workers between different district firms and the spin-off phenomena that generate new firms from the breaking up of bigger firms and the initiative of former workers of such bigger firms. All these phenomena are based and, in turn reinforced, on the dense relational network within the local system, founded on common trust, culture and identity.

The chances of knowledge diffusion offered by network technologies, such as the sharing of on-line best practices, the creation of virtual communities (Micelli, 2000), the creation of databases for the access to on-line curricula, or the various modalities of e-learning seem to be insufficient to grasp the real essence of the knowledge generated within the district. The exchanged know-how working side to side, the trust developed working face-to-face and the reliability generated through informal verbal exchanges are left out (Rullani, 2000).

Therefore, it seems that the actors that operate within districts have a clear perception of the limits imposed by network technologies and their distrust in this context seems to be a justified precaution against a whole of "poor" means of communication in relation to the district social network's richness.

Nevertheless, Johannessen et al. (2001) argue that the only way to fully exploit ICTs potential in transferring and creating knowledge within a

community is by making explicit tacit knowledge through thrust and relationship building processes. This statement, while confirming that only explicit knowledge may be transferred through IT, opens some challenges quite interesting for IDs. Among district firms, the relationships do exist at different, e.g. economic, social, cognitive, levels, but until now entrepreneurs have been mistrustful of the role of network technologies within their social network.

This issue is strongly related to the district firms' willingness to co-operate. Staber (1998) addressed the issue of balancing co-operation and competition within IDs and in a recent study (Staber, 2001) he demonstrates that a co-operative attitude among district firms increases the performance of the co-operative firm. In this perspective, the introduction of network technologies may constitute an opportunity to develop firms' co-operative attitude, but empirical data show that the diffusion of integrated software, such as ERP, is still limited to internal process management and inter-organizational solutions (i.e. Customer Relationship or Supply Chain Management) are far from being taken into consideration and evaluated, let alone implemented. Furthermore the social learning mechanism seems as discussed earlier not to work inside IDs – the successful implementation of a technological solution by one or more firms still not has convinced other firms to adopt that technology.

Finally, if a critical mass of adopters will be reached (Markus, 1990), a substantial increase in complex technologies implementation could be expected. Indeed, due to the interactive nature of this kind of technologies, if a sufficient number of firms adopt a Supply Chain Management Tool, their suppliers will be forced to adopt it in turn in order not to loose their customer leading to an growth of the diffusion rate for this type of networked technologies.

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Chapter 3

WHERE IS THE INNOVATION?

The Adoption of Virtual Workspaces

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Abstract: This paper reports from a case study of the introduction of a web-based groupware application – Lotus QuickPlace™ – in a large European financial organization. Our study challenges the commonly held assumption in DOI research that "all use is equal", implied when DOI is used to study the adoption of technologies. The underlying problem is that in order to understand the diffusion of groupware, we need to distinguish between two separate innovations. The first is directly related to the DOI "innovation-decision process" – centered on the technology as the innovation. The second innovation is more related to how the technology is put to use. This has consequences for devising strategies for the diffusion, and we suggest a strategy for diffusing virtual workspaces, which combines the DOI framework's one-way communication with the two-way communication of a participative approach

Key words: Virtual Workspaces, Groupware, Adoption, Diffusion of Groupware, Participative approach

1. INTRODUCTION

Virtual workspaces have been introduced in organizations as a successful new breed of internet-applications. They exemplify modern networked information technologies, which offer support for inter- and intra-organizational communication and collaboration through the sharing of files, joint editing of documents, shared calendar etc. A virtual workspace is an inexpensive, decentrally managed groupware application open to a lot of different settings of use. Lotus QuickPlace is a virtual workspace product offered by IBM. According to IBM, Lotus QuickPlace (recently re-named: Lotus

Team Workplace) is used by 60 percent of the Fortune Global 100 companies (IBM, 2003). This diffusion of virtual workspaces has happened in a two-three year period, which suggest characterizing it as a commercial success.

A virtual workspace is typically introduced into an already existing suite of applications for communication and collaboration such as e-mail, intranet, telephones, and LAN-drives. The introduction of virtual workspaces is rather simple from a technology point of view, but it exposes the user to a lot of complexity as (s)he attempts to integrate the technology into the existing suite of communication technologies in specific collaborative settings. Virtual workspaces are also characterized by the difficult task left to the users of establishing useful patterns of communication and collaboration based on the technology.

We have studied the adoption and use of Lotus QuickPlace in a distributed organization. Our study documents that the above characteristics of the technology challenges how we should understand its diffusion and adoption. It therefore has consequences for what constitutes a good strategy for diffusing virtual workspaces.

The theory of diffusion of innovations (DOI) is being used extensively to study the diffusion of information technologies, and is being used as a framework for understanding the adoption of new technologies in organizations (see Prescott and Conger (1995) for an overview). Using DOI as the framework for understanding the adoption of technologies in an organization implies that the technology as such is seen as the innovation. In other words, "all use is equal" in the eyes of DOI (see e.g. Prescott and Conger, 1995; Mark and Poltrock, 2001). A quote from Rogers (1995, p. 21) also illustrates the point: "The innovation-decision process can lead to either *adoption,* a decision to make full use of an innovation as the best course of action available, or to *rejection,* a decision not to adopt an innovation." Despite the attention in DOI research towards "re-invention", i.e. the degree to which an innovation is changed or modified by users during its adoption or implementation (Rogers, 1995, p. 174), we do not find that this concept fully captures our findings.

In our study of the adoption and use of Lotus QuickPlace we have found that the assumption "all use is equal" is not well suited to our results. Basically, we have found that use differed to such a degree that it is problematic to denote it as one single innovation. We suggest that to understand the adoption of virtual workspaces distinguishing between two levels of innovations is more fruitful. The first level is directly related to the "innovation-decision process" – the innovation being the technology that it is decided to adopt. At the second level however, the innovation is closely related to how the technology is put to use – not a simple question with a flexible

and open-ended technology like Lotus QuickPlace. This becomes evident when devising a strategy for the diffusion of virtual workspaces in an organization. While the DOI framework seems suitable for diffusing the use of virtual workspaces to individuals, a participative approach seems more appropriate when it comes to the diffusion of virtual workspaces in social practices of collaboration in a group of people in the organization.

Lyytinen and Damsgaard (2001) have questioned the value of the DOI framework for understanding the diffusion of inter-organizational, complex technologies exemplified by the diffusion of EDI. We argue that even with technologically simple, intra-organizational systems, we need alternatives to the DOI framework to understand the diffusion. We suggest that detailed studies of usage might inform the process of understanding and devising strategies for the diffusion. We suggest a strategy for the diffusion of virtual workspaces that is partly based on DOI, partly based on a participative approach, which can facilitate the innovation of new social practices of use in a group. In the area of research on the communication of development e.g. on AIDS to the developing countries (Tufte, 2001), the need to combine these strategies has been identified. We suggest that this insight could inspire the diffusion of virtual workspaces and other networked information technologies for collaboration and communication in organizational settings.

The paper is structures as follows. After presenting the research setting and methodology we first present the results of our case study relevant for challenging the "all use is equal" assumption and the assumption that we are dealing with one innovation. We then discuss the implications of our findings for how implementation efforts should be approached and suggest a strategy for the diffusion of virtual workspaces in organizations.

2. RESEARCH SETTING AND METHODOLOGY

A few years ago, a large financial company was formed by a merger involving financial companies (private, corporate, and investment banks and insurance companies) in four European countries. The company, which we call Summa in this paper, produced a 2001 net profit of app. 1,500 MEUR. Following the merger Summa needed a solution that could support the collaboration and communication in post-merger projects and reduce travelling costs after the merger. Summa formed several organizational units spanning across the four countries, including core business areas as corporate banking as well as support functions like IT, human resources, and communications, and projects were defined to merge operations. Lotus QuickPlace was chosen as the solution based on previous experience with Lotus products, and the technology was introduced approximately 1 month after the merger. In

line with the way Lotus QuickPlace presents itself on the web – "create a Team Workspace on the Web instantly" and "A QP is a place that you can create on the Internet in 30 seconds to communicate with your team, share resources, and keep track of your project" (IBM, 2003)- the efforts to diffuse the technology in Summa were limited. Neither formalized education nor guidelines for the usage were offered. The only educational resource available was the built-in help function in the software package. The availability of the technology was announced through e-mails and oral presentations to selected groups of people – typically middle managers at headquarters.

2.1 Data Collection and Analysis

This paper is based empirically on data from a case study of Lotus QuickPlace, hereafter QP, in Summa. Based on contact with the Communication Section, one of approximately 15 headquarter sections with a staff of 50 employees, we have studied its adoption and use intensively over a 10-month period. Our case study used different empirical sources:

- semi-structured interviews with managers and users in three selected QPs, and with persons involved in the implementation processes;
- an analysis of the technology and central documents related to the implementation in Summa.
- a web-based questionnaire among managers of all QPs;
- an analysis of the QP server's http-log using data mining techniques.

The interviews were all conducted in a three-month period in spring 2001, one year after the introduction of the technology. They involved managers and users in three selected QPs: one used by a post-merger technological infrastructure project and two used in the Communication Section. The interviews used an interview guide, were tape-recorded, and transcribed ad verbatim.

The document analysis comprised documents describing the intended aim of using QP for all QPs resident on Summa's QP-server at the beginning of our study (90 email documents in total), and an analysis of the structure and contents of the three QPs from which we interviewed users.

In fall 2001 an online questionnaire was carried out. We sent out invitations to 123 managers of 77 QPs identified as active in the first round of studies. 57 managers from 45 QPs responded – corresponding to a response rate of 46 % of the managers, covering 58% of all QPs. The questions were all related to the use of QP – who are the users, what is the QP used for and how is it used.

The logging of all http transactions to and from the QP server was initiated at the beginning of our study and lasted 10 months. The log file docu-

ments all users' actions on the QP-server such as when documents are created, read, or edited and by whom. The log file data were cleansed and a number of data mining techniques were used to analyze the user operations, i.e. create document, read document, edit document or open an attachment. An important analytical unit used for the analysis was the "document life cycle", which characterizes the life of a document on the QP server by the operations performed on it from its creation. Please refer to (Bøving, 2003) for a thorough discussion on the use of log analysis as a method for providing insight into the use of web-based applications.

3. THE ADOPTION OF QUICKPLACE IN SUMMA

Lotus QuickPlace is a flexible technology, which offers its users a web-based shared workspace with a folder structure, notification functions, support for custom document types and support for simple workflows. It was originally developed as an Application Service Provider (ASP) application where either the software developer or a third party hosts the application and rents it to the customer on a per-use basis. This background gives the application some basic characteristics:

- It is very open and flexible in terms of which kinds of collaboration it supports. There is no suggested workflow inscribed in the application for example to support projects, recurrent tasks, interest groups, etc.
- It is integrated with e-mail and it is typically introduced in settings where supplementing and competing technologies are already in place (e-mail, Intranet, telephone, LAN-drive, etc.).

These characteristics make the software both inexpensive to purchase and – so it seems – inexpensive to adopt in an organization. Once the QP-server is installed, a person with QP-manager rights can set up a particular QP. This includes inviting members to the QP, defining the structure of rooms, folders and document types, as well as defining access rights to each room and folder. Each QP thus consists of a number of rooms with folders containing documents that can be reached by a single URL. However, with the open-ended and flexible character another characteristic is implied: It is based on the assumption that the users themselves define for what purposes and how they wish to use the QP. The members of a QP need to agree on how to work together using the tool in a specific context, e.g. using the tool as a shared archive, or as a coordination mechanism for collaborative work.

3.1 The Successful Diffusion

The decision to introduce the QP technology to support the post-merger projects in Summa was taken without thorough studies of needs and possibilities. QP was a "quick and dirty" solution, which fulfilled some technical requirements: it was web-based, needed no integration with the existing security infrastructures of the pre-merger companies. It could thus be implemented very quickly seen from an IT Operations point of view. One month after the merger the Communication Section was commissioned to distribute QP in Summa. Some resources were spent on customizing the look of the application, but apart from that the only formal means of communication from the change agents in the Communication Section to potential adopters was an email and oral presentations. Adopters could apply for opening a new QP by sending an email to IT Operations. The original idea was that the application e-mail should contain a business justification, but in practice all applications were approved. Our study of all application emails sent to IT operations shows that the rule of thumb for granting an application for a QP was that the group should have geographically dispersed members. Attempts at providing business justifications hardly occurred.

The number of active QPs had been growing steadily in the first year at Summa before we entered the organization. In the first month of our log-period there was activity in 80 QPs by 805 different users. The growth continued during the 10-month log-period with 126 QPs and 1618 users active in the last month. Table 1 shows the development in activity over the 10-month period.

Table 1. Development of QP activity in 10 month period in Summa

Activity measure	Development in activity
No. of active QPs	+58%
No. of active users	+101%
No. of operations	+275%
No. of operations pr. QP	+138%
No. of operations pr. user	+87%

The table shows that the use of the QP technology expanded significantly in the 10-month period. More users in a growing number of settings used it more. Also, the technology was diffused in other settings than the ones intended by the change agents. Initially the technology was only meant to support the merger projects. Figure 1 shows the responses in the questionnaire to the question: "What group of people is using your QP?"

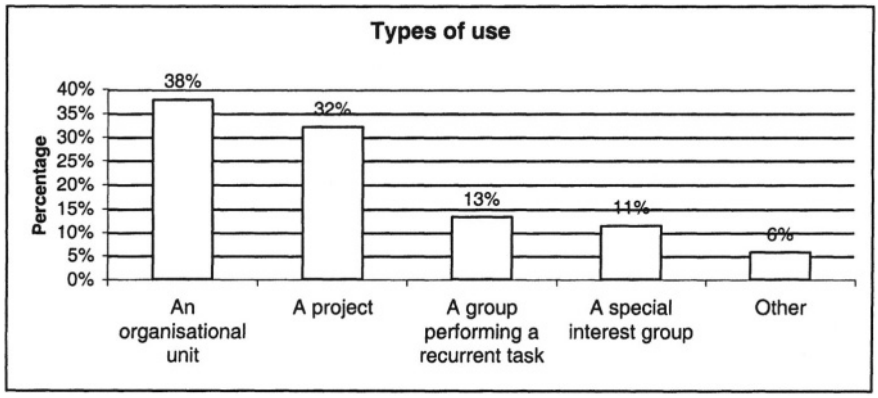

Figure 1. Distribution of Use Context for QP in Summa

The following examples derived from the questionnaire illustrate the diversity of use:

- Organizational unit: the QP supports an organizational unit spanning four countries as well as all other countries where Summa is present. The QP is used for holiday lists, to support credit projects, distribute credit limits and related information on issuing credits to large customers, and for marketing materials.
- Project: The QP is used as a project repository for an IT infrastructure project, including project deliverables, information on technology, meeting minutes and documentation of decisions taken.
- Recurrent tasks: the QP is used to support the translation of financial reports, press releases and an internal magazine into five languages.
- Special interest group: The QP is used to support communication in a cross-functional and cross-organizational group of experts working with the same technology. The QP is used for *"Discussions, experiments, programming, documents. All relevant topics that have to do with the Domino platform within Summa",* (questionnaire quote).

In sum, the use of the technology has been growing during our study, and it has spread to serve other purposes than the ones originally intended. The QP technology was introduced to support merger projects and new distributed organizational units, but our study clearly shows that the technology has diffused into other areas. On this level of analysis, the diffusion and adoption thus seems a success. Without large efforts in terms of communication the technology has spread.

The study of the adoption of QP as we have presented it here does not answer *how* the technology has been diffused or identify factors for the successful diffusion. It merely documents a successful diffusion of a technol-

ogy. Our presentation of the case has used the "all use is equal" assumption inherent in the DOI framework. We have reported on the activity level and number of users and discussed the settings in which the technology is used. However, if we take a closer look at the kind of usage and thus skip the "all use is equal" assumption, a rather different picture emerges.

3.2 The Not so Successful Adoption

As part of the analysis of the log files, we used "document life cycle" as an analytical unit for understanding the use of QP. A document life cycle is the trajectory of all operations on a document in a QP. The document life cycle analysis shows a pattern, which is rather disappointing. Firstly, the typical lifecycle of a document in a QP in Summa is that someone publishes a document which is then never touched again. No subsequent operations like edits, reads, moves or deletions are performed on the document, and we have therefore denoted them "dead" documents. This life cycle is observed for 70% of the documents. Secondly, for the remaining 30% of the document life cycles the typical pattern is that a document is published by someone and then subsequently read by a number of people. The QP technology offers support for the collaborative production of documents by a locking mechanism, which prevents multiple persons editing the document concurrently. This feature is only very rarely used (0,3% of all document life cycles).

Both when we use the document life cycle as analytical unit and when we use the individual QP as the analytical unit, the use of the QP technology is characterized by a large number of unsuccessful attempts. We studied 37 QPs, which were all started during the log-period. By analyzing the weekly number of users, document reads and document edits, we portrayed the activity in each new QP. This analysis showed that 14 of the 37 QPs, or 38%, only showed very fragmented use, or no use at all. While all 37 were based on a conscious decision to start using a QP, it did not result in a sustained use of the technology in more than one third of all QPs started in the logging period.

Another characteristic of the use of QuickPlace is that the use is intertwined with the use of other media, sometimes in a competing, sometimes in a supplementary manner. There is not at all a clear distinction between the situations when the QP is used and when e-mail or telephone is used. In most cases they are combined. Responding to the inclusive question "Which other media do you use to communicate or exchange files with the other members of the QuickPlace?", 95% of the respondents selected "e-mail", and 60% selected "telephone" as well as "face-to-face".

As an example of the intertwined use of QP we studied in detail, based partly on interviews, partly on log analysis, how a QP supported the process of translating a press release. The QP studied was used to collect the translated documents and make them available for proofreading and review. The analysis showed that a mix of strategies for using the QP was adopted. In general, the e-mail system was used in parallel with the QP and actually served as the primary means of routing the translations from the translators to the people responsible for the publishing of the press releases in the different languages. The primary role for the QP was that reviewers and other stakeholders could access the translations from the QP. Another observation was that some translators did not upload their translations directly. Instead they e-mailed the documents to people that would then upload them to the QP, thus acting as "proxies". This intertwined use of e-mail and QP sometimes makes sense given the functionalities provided by both systems, but in some cases it is clearly dysfunctional given the superiority of QP in terms of handling various versions of documents and controlled access to documents. Lack of trust that receivers of information will act appropriately to the documents distributed via the QP was the typical explanation given by informants for the dysfunctional or "irrational" use.

To sum up, both the large percentage of dead documents and the QPs, which are started but never get into momentum during the 10-month log period, indicate a lot of unsuccessful attempts to use the technology. The uses of QP in the remaining 30% of the documents studied shows a simple life cycle, while in other situations (the translation of press releases) the potentials of the technology are not fully utilized. The result is a portrait of the adoption, which is quite different from our initial picture.

4. DISCUSSION

The two perspectives on the adoption of QP produce two very different conclusions. The first perspective shows a successful diffusion of a technology. The first perspective also exemplifies a traditional approach to studying the diffusion and adoption of a technology. Our detailed study of the actual use patterns shows, however, that the assumption that "all use is equal" causes blindness to aspects, which in our case turn out as being essential for assessing the adoption of the technology. While the technology has been diffused, our study shows that the potential of the technology for developing new patterns of coordination and communication has not been realized.

As suggested by Newell et al. (2000) it might be useful to turn away from the diffusion of the technological artifact and focus on the spread of the ideas and knowledge underpinning the technology. If we observe the

diffusion of QP in Summa with the eyes of Rogers-inspired DOI research, the technology has diffused quickly and successfully given the very limited focus on communicating about the technology and its advantages. If we instead focus on the spread of the ideas and knowledge underpinning the technology, the diffusion seems more disappointing. Most users and groups of users do not seem to have grasped the potential of collaborating in new ways supported by QP, at least they have not yet changed their way of working together using the features of the QP accordingly. The question arising at this point is: why don't the users use the technology in ways, which utilize its potential? We think there are two interrelated and supplementing approaches to account for this.

The first approach focuses on the individual user and his understanding of the technology. As Orlikowski and Gash (1994) have shown in their study of the adoption of Lotus Notes, users' different understandings of what a technology is affects the adoption of a technology. Their concept of "technological frames" (a species of cognitive frames) is used to capture the understanding of the technology. It seems plausible that the lack of diffusion of the potential of the technology is due to the technological frames with which the individual users approach the technology.

The second approach focuses on the group of users trying to establish use of a technology to support their communication and collaboration. In the field of CSCW it is generally acknowledged that the coordination of collaborative work is a social and difficult activity. Also, it is well known that the introduction of technology to support coordination requires re-negotiation and re-creation of protocols (Schmidt and Bannon, 1992; Schmidt and Simone, 1996). The theory of genre of organizational communication (Yates and Orlikowski, 1992; Yates et al., 1997) suggests that the introduction of new technology will initially support existing genres and that change in genres requires a redefinition of these over time by the participants themselves. This approach thus focuses on a social activity of re-negotiation, re-creation and re-definition of social structures in the group of users of a QP. In other words, people actually need to agree on how to use the system, and to establish trust that actions and reactions are appropriate.

On the one hand, we have an approach that suggests that people's cognitive frames define their adoption of the technology. On the other hand we have an approach that suggests that the users through peer-to-peer interaction and negotiation define the use of a collaborative technology.

We agree with DOI theory that the QP technology constitutes an innovation in the sense that it offers new potentials for collaborative work and communication. The DOI framework – when applied to the diffusion of a collaborative technology – overlooks, however, a second innovation process. This second innovation process does not come from a central source, but is

based on local, situated actions. It is the innovations produced when groups of people agree on using the technology to support novel protocols (in the words of CSCW) or genres (in the words of genre theory).

Bøving (2003) has suggested – in line with Yates et al. (1997) – that the analytical unit of usage in virtual workspaces should be a genre of communication. If the genre of communication is suggested as the unit of analysis of use, a genre of communication captures the result of an innovation, which is just as important as the innovation of the technology. Both approaches are important in the understanding of the diffusion and adoption of virtual workspaces.

Our findings thus suggest that the adoption of virtual workspaces like Lotus Quickplace can only be understood as related to two different innovations. This has practical consequences for the strategy one should use for the diffusion of virtual workspaces in an organization.

4.1 A Strategy for the Diffusion of Virtual Workspaces

In the field of communication for development, i.e. changing the behaviour of people in Africa facing the threat of AIDS/HIV, two strategies have dominated. On the one hand strategies based on the DOI framework, and on the other hand strategies based on a participatory communication framework (Servaes et al.,1996; Servaes, 1999). As for example Tufte (2001) argues, these strategies should be combined so that the one-way communication approach based upon a DOI framework is used in conjunction with a participatory communication approach. Table 2 summarizes the key points of a combined approach.

Table 2. Key Features of Tufte's Integrated Communication Approach

	DOI approach	Participative approach
Change agent	The management deciding to implement the technology in the organization	Users are the agents of change
Means of communication	One-way mass media approach	Dialogue, community based action

We suggest using the insights from the communication of development to propose a strategy for the diffusion of virtual workspaces and other collaborative technologies in organizations. While the DOI approach should address the (change of) users' technological frames, the participative approach should address the need for groups of users to establish new genres of communication through peer-to-peer interaction.

The one-way communication approach should deal with the following aspects of diffusion and adoption of the technology:

– the goals of introducing the technology in the organization.

- the basic functionalities of the technology.
- guidelines for usage related to the existing technology landscape.
- best practices on how the technology can be utilized.

Several media could be relevant for communicating these aspects of technology diffusion and adoption. In the case of Summa, some of this communication stems from software vendors who communicate the wonders of the technology to the market. They also produce the basic tutorials for using it. Other relevant media of communication originating centrally in the organization could be Intranet, feature articles in employee magazines or e-mails. The efforts should be aimed at individuals in the organization and contain information aiming at changing the technological frames of users and managers who wish to initiate the adoption of a technology.

The participatory approach should deal with the following aspects:

- the establishment of practices related to single QPs.
- facilitation of the establishment of roles in the group.
- facilitation of establishing new genres of communication, which utilizes the technology.

The role of the change agent in the participatory approach is not to communicate an innovation. The role is rather to facilitate that the group invents new ways of collaborating and communicating utilizing the potentials of the technology. The means of providing facilitation could be start-up workshops for groups. The purpose of the workshop is to brainstorm ideas about usage of the technology as well as establishing agreements on the use. One important aspect of adopting virtual workspaces is the agreement on a structure and processes to maintain it (Bøving, 2003).

This two-fold strategy of diffusing collaborative technologies like virtual workspaces addresses two kinds of learning: one directed towards using the system and communicating the strategy for using the system, and one directed at establishing genres of communication in the group that chooses to use the system.

5. CONCLUDING REMARKS

The study of the adoption of Lotus QuickPlace in Summa has shown that using the DOI framework as the only vehicle for understanding the adoption of a collaborative technology is problematic. The basic problem is that the adoption of collaborative technologies cannot be grasped by the diffusion of the technology. If we equal the technology with the innovation, it creates a problematic assumption that “all use is equal”. In our case it turned out that all use is not equal, and we suspect that this is the case with other collaborative technologies in other settings. The DOI framework thus only captures

some aspects of the adoption of collaborative technologies in an organization.

The results from our study showed that while the technology was diffused and adopted, the innovation – which could be captured in a statement like "to use the QP to create novel ways of communication and collaboration" – was not diffused in Summa.

The conclusion in terms of future research in the diffusion and adoption of collaborative technologies is that detailed studies of use can inform the study of the diffusion process and inform the development of strategies for the diffusion of collaborative technologies. We do not question the DOI framework in itself, rather we have showed that it should be used cautiously in the study of diffusion and adoption of collaborative technologies in distributed organizations. The basic argument is that we are dealing with multiple innovations. And the technology is only one of them.

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Chapter 4

CO-ORDINATION OF E-GOVERNMENT

Between politics and pragmatics

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Abstract: E-government is a move towards more use of networked information technologies in governments' services to citizens and companies. There will be strong expectations that these services are well co-ordinated and interoperable with the applications of citizens and companies. IT co-ordination is difficult, expensive and risk prone. The wide range of products and services in government makes co-ordination even harder. Co-ordination of e-government should therefore be carefully prioritised and the ambitions should be set at a reasonable level. Analysis shows that ambitions are often unrealistic, and that political goals seem to dominate over effective, stepwise approaches to co-ordination. On a pragmatic level, there is a need to focus on simpler, process-oriented mechanisms for co-ordination and to improve governments as software organisations. There are considerable challenges in the typical split of work between ministries and operative agencies in government.

Key words: public administration, e-government, IT co-ordination, technology adoption, information infrastructure

1. INTRODUCTION

E-government has become the commonly adopted term for modernising government with networked information technologies. Government is a large sector in most developed economies, and represents an important case for diffusion and adoption of technology. To a certain degree, governments have their own ways of organising and managing their operations, and also specific requirements and a very wide set of possible uses of information

technology. This represents challenges for the management and co-ordination of e-government.

As citizens and companies deal with different parts of government, and as there is a need to support lateral cooperation within the government sector, there is considerable need for co-ordination of e-government. This is reflected in many policy documents from various governments and from, e.g., the European Union. This paper discusses the realism of these efforts and contrasts them with practical experience and with relevant theory on information systems development. The intention with the paper is to provide a critical appreciation of current approaches to the co-ordination of e-government and to provide advice for realistic approaches.

There has not been a separate data collection for this paper. The topic of the paper was, however, my area of work from 1997 to 2001 as head of the IT-department of Statskonsult, the Norwegian Directorate of Public Management. In that position I could participate in and observe several projects, and I would read and comment upon policy documents on e-government. In the winter of 2000 I was given the opportunity to collect information from the Finnish government on the same topic, see Sørgaard (2000). The reasoning of the paper will therefore sometimes be theoretically grounded, sometimes based on practical experience or on talks with informants in the Norwegian and the Finnish public administrations. This paper is based on earlier contributions to the OECD project on e-government.

The paper is organised as follows. Section 2 introduces theoretical material on the range of issues touched upon in this paper. Section 3 argues in more detail that large organisations cannot have full control over their use of IT. Section 4 describes the nature of and challenges with e-government, while section 5 addresses management of e-government and section 6 discusses co-ordination of e-government. Section 7 draws some conclusions.

2. THEORETICAL BACKGROUND

This paper discusses the issue of management and co-ordination of e-government on the basis of several approaches: systems development, organisation theory, co-ordination in public administration, IT as infrastructure and finally studies of technology.

Systems development is a sub-discipline of computing science dealing with methods and theories for design and development of applications of IT. It has close connections to disciplines such as information systems and software engineering. Within the field, several systems development methods have been published. This paper comes out of the so-called

Scandinavian school in systems development, where systems development is seen as an organisational and indeed political process, besides its obvious aspects as a technical process. Dahlbom and Mathiassen (1993) have written a seminal introduction to this school of thought. Within software engineering much work has been undertaken to define appropriate models for conducting software projects. Boehm (1976) defined the traditional approach, dividing software projects into phases such as: system requirements, preliminary design, and code and debug. This so-called waterfall model has since been criticised for being too rigid, not allowing experiences from later phases to inform the requirements or the design. Boehm (1988) has himself dealt with this issue and proposed an iterative model, or a spiral model, for systems development. Humphrey (1989) has proposed the well-known Capability Maturity Model, which defines five levels of maturity in software engineering, and which also defines the process areas that need to be handled in order to "grow" from one maturity level to the next.

Organisation theory describes and discusses different approaches to deal with the challenges of organising work. Galbraith (1973) has written a classical theory, where the focus is on mechanisms for handling task uncertainty. In large organisations there is seldom one, ideal organisational design. Every choice of functional units, independent product divisions, etc. will represent a compromise between different needs. In practice, every hierarchical organisation will need to handle lateral relations. Galbraith discusses seven approaches to lateral relations, with increasing ability to co-ordinate (and with increasing cost):

1. Direct contact between managers
2. Creation of liaison role
3. Creation of task forces
4. Use of teams
5. Creation of an integrating role
6. Change to managerial linking role
7. Establishing the matrix form

Most of these designs can be observed in work with co-ordination of e-government, but the more radical designs are hard to implement in governments that emphasise ministerial autonomy. Ministers without portfolio, for example, are clear examples of an integrating role at a high level. Given the permanent crosscutting nature and derived co-ordination needs of some of the topics of e-government, attention to structure is important, but "structures, while important, cannot guarantee successful co-ordination" (OECD 1996, p. 20).

Williamson (1981) defines a transaction cost approach to understand organisations. He sees an organisation abstractly as a stable network of transactions, and sees the hierarchy (or bureaucracy) as an approach to

handle transactions which cannot be completely specified a priori, and which therefore are better handled in a more permanent relationship, e.g. in an employment relation. More transparent transactions can be handled in the market, and even more complex transactions need to be handled in idiosyncratic organisations such as clans or groups.

Co-ordination in government is an example of lateral relations. Eriksen (2001) compares the structures of the ministries in Great Britain, the Netherlands, Sweden, Finland and Denmark, with a focus on mechanisms for co-ordination. According to Eriksen the countries differ heavily in their ways to achieve co-ordination, and indeed, in the emphasis put on co-ordination. Great Britain represents one model with the dominant position of the Prime Minister and the Cabinet Office. Denmark represents another model where individual ministers make most decisions. Sweden is a third model, where the government collectively makes the decisions. Norway has many similarities with Denmark, and Finland has many similarities with Sweden, although they are not as archetypical as their respective former union partners. Other sources to co-ordination in government are OECD (1996), and Pollitt and Bouckaert (2000).

Eisenhardt and Galunic (2000) have studied how large corporations are organised in divisions and how synergies between otherwise independent divisions can be achieved. They suggest that work with synergies should start in the divisions in order to focus on realistic projects, and that the role of corporate management is to stimulate this kind of co-ordination, not to perform it. While exclusively borrowing from cases in private business, their discussion also has some relevance to government.

In a review of the current literature on the management of information infrastructure, Ciborra (2000) contrasts a traditional management definition and an alternative definition of infrastructure. The traditional definition sees information infrastructure as a layered structure with layers like IT components, human IT components, shared IT services, and shared applications. In this view infrastructure is seen as the largest component of a company's systems and applications, which are reliable, shared, and usually centrally managed. This view is closely connected to the idea of strategic alignment, which Ciborra criticises for its tendency to lock a company to its current way of doing business. Ciborra borrows the alternative definition of information infrastructure from Star and Ruhleder (1996), who characterise infrastructure as "fundamentally and always a relation". They state that it operates through standardisation and extension of linkages; it is sunk into other social arrangements, institutions, and technologies; it is invisible and transparent in supporting the execution of tasks; it is embedded in a set of conventions of practice; and it is an installed base: infrastructure does not grow de novo; and it wrestles with the inertia of the installed base and

inherits strengths and limitations from that base (Star and Ruhleder 1996, p. 113). Ciborra argues that the traditional definition assumes strong central control over the infrastructure, and that this is inconsistent with empirical observations of use of infrastructure that indicate that the evolution of infrastructure is better characterised as drift.

Star and Ruhleder (1996) analyse the experiences from a large-scale effort to support a geographically dispersed community of geneticists with infrastructural computer support: WCS, the Worm Community System. In doing so, they describe infrastructure as a relational property, not as a thing. In their analysis of the varied user experiences, they use Bateson's model of levels of learning to distinguish between three different levels of issues related to the computing support being analysed. First-order issues are straightforward and practical issues, such as "how do I hook up my workstation to the network?" Adding resources, training or information can solve such issues. Second-order issues stem from unforeseen contextual effects or conflicts between first-order issues, for example the dilemma between finding the computer best fitted for the community infrastructure and the computer best fitted for the local network and the local computer support. Such issues need to be resolved through co-ordination and planning at levels beyond what the individual user can accomplish through extra efforts and resources on her own part. Third-order issues are inherently political or related to ongoing conflicts or difficult tradeoffs. Examples here may be the view of the research field supported by the system or norms and culture related to openness, critique and information sharing. To the extent such issues can be resolved, it will involve discussions beyond the scope of design and use of the system studied.

The distinction between three levels of issues can be immediately applied to discussions about e-government. In a large-scale e-government effort there will be a lot of first-order issues: typical examples will be related to access to networks and equipment, training, stability of software, quality control, etc. Second-order issues may be a series of interoperability issues like the kinds of software and hardware needed to use the solutions. Moreover, there will be issues of adaptation of work practices in agencies to new expectations and service needs from citizens and companies. Third-order issues may arise as e-government aims collide or interfere with other political issues. Examples are reduction of work force in rural areas, conflicts between electronic transmission of documents and rules for data-security and authentication, archive regulations and informal practices with e-mail, and use of incentives for electronic solutions that may end up as privileges to those clients of government who are well equipped and trained to use computers. A typical political problem is related to whether, how, and

to what extent e-government initiatives can be used as a way to propel development of the domestic IT industry.

Studies of technology are also of relevance. Monteiro (2000) has made a summary of actor network theory. This theory gives room for seeing technology as an actor on its own. Ciborra (2000) argues that since an information infrastructure is so deeply sunk into social practices and shaped by factors not in control by one company, it makes sense to view an information infrastructure as an actor and to describe the relationship between a company and its infrastructure as more symmetrical. In a sense, this introduces a degree of apparent technology determinism, well in line with what we often experience in practice.

Yates (1989) has studied "new" technologies in American companies at the end of the 19th century. Her study shows how new technologies and new business practices evolved in a mutually adaptive pattern. Important technologies like the vertical filing cabinet and the telegraph were not "born" with a ready set of use practices. Their use evolved slowly, and thus such technologies, when introduced, contributed to important, unforeseen changes in the ways organisations worked. Yates' study has much to tell us about our limited ability to predict how new technologies will be used, and about the processes through which new technologies are adopted by organisations and society. In a sense, we do not know what e-government will be like before we have it, and there is every reason to expect it to be different from common expectations.

3. LOSS OF CONTROL

Modern organisations shape technology for their purposes and are at the same time shaped by the technology they apply. Technology alone will seldom change organisations, and organisations must make efforts to be able to benefit from technology. Thus, we have neither full technology determinism nor full social (and political) control of the use of technology. Modern technology will, at least as seen from each organisation or each government, appear as an independent actor (Monteiro 2000).

The scope of ready-made software is expanding. As a consequence, a larger part of an organisation's functional needs may be met by ready-made software. At the same time we observe that in-house development is risk-prone and expensive. Adapting ready-made software packages is also expensive, since adaptations often will have to be made by specialists and since adaptations typically will need to be refitted for new versions of the software packages (Hanseth and Braa 2000, Hanseth et al. 2001).

Increasingly, the challenge is therefore to use and harvest the potential benefits from ready-made software as it is.

A key area for ready-made software is peer-to-peer communication as supported by e-mail, instant messaging, chat, intranets and newsgroups, to mention a few. It is typical for these media that they invite to informal style (Eklundh 1986). Clashes between archivists struggling for persistence and reformers struggling for maximal use of new means of communication are not uncommon in government. Without appointing winners and losers in these battles, it can be safely assumed that governments will be heavy users of informal communication media. The question will not be whether to use, e.g., e-mail, but how, with what kind of culture and with what other means to ensure the needed degree of persistence.

The "effects" of use of IT in general and electronic communication in particular are hard to judge. In a summary of the computing and centralisation debate, George and King (1991) concluded that the theses of centralising and decentralising effects of computing were not well supported. They also rejected the statement that computing had no effect on this issue. Instead, they claim that computing tends to reinforce current structures, i.e. that in a setting where the dominant forces work for centralisation, computing will typically be applied in a way that further enforces that trend.

There are some observations that appear to be commonly accepted. Feldman (1987) observes, for example, that electronic mail is well suited to create and maintain weak ties. At least to some extent, this may support a trend towards less clear organisational boundaries.

Taken together, the observations above mean that a smaller part (in terms of volume and importance) of the communication takes place through official channels. To be concrete: middle managers, especially in government, used to be able to have an overview of incoming and outgoing communication as an effect of routines for distribution and approval of conventional mail. This source of automatic authority now erodes, and managers will need to learn other ways to manage.

The processes of developing software are hard to manage. Within the field of software engineering, serious efforts have been made to improve these processes (Humphrey 1989, Boehm 1988). The reasons for these problems are not only to be found in technical complexity, but also in uncertainty (Galbraith 1973) and in political games around the processes (Dahlbom and Mathiassen 1993). This calls for alternative approaches, less characterised by engineering and control, and more characterised by experimentation and flexibility.

As already mentioned, new technology is being used in patterns characterised by mutual dependence between actors. Organisations will therefore not enjoy full freedom in their development and application of IT.

They will rely on their partners, their suppliers, their customers, their employees and the available infrastructure where they are located. Organisations will look for ways to handle this, in terms of getting competent advice (from internal or external sources) about what aims to go for and in terms of finding adequate processes. We are seeing a shift from constructing IT for the (given) purposes of the organisation to looking for opportunities to support and also to change current business with new applications of IT.

There are important differences between countries and markets with respect to penetration rates of important technologies and with respect to availability of infrastructures and supporting resources. Within OECD there are significant differences in penetration rates of home-based Internet connections and mobile phones, and regarding diffusion of cable TV the rates vary from practically 100% (Belgium) to practically zero (Italy) (OECD 2001a). This is not only a question of some countries being ahead of or more developed than others, but different technologies appear to fit different markets differently: some countries are high on mobile phones, some on Internet, some on both, some on neither. There may be historical, political and even cultural reasons for these differences. For all kinds of organisations, these differences mean that the ways to approach e-business will differ between countries and markets. It may be hard to transfer "best practices" from one country to another, and it may also be hard to enact tight central control over IT in multinational companies.

IT represents an important enabler for organisations. Within a market, those organisations that exploit the potential of the technology better will "win". Malone et al. (1987) use this kind of argument together with transaction cost theory (Williamson 1981) to predict that we will see a shift from bureaucracies to markets, since market transactions are better supported by IT than are transactions in the bureaucracy. We may use this line of reasoning to expect that some organisational configurations (one or several) will benefit more from new IT than others. We may further expect that these kinds of organisations through their increased market power will have a greater impact on the properties of ready-made software. This will result in a self-reinforcing effect, which over time will lead to shifts in the mix of successful organisational designs and in available technology. Most likely, this development will also have an impact on government, making certain ways of organisation more attractive, and in some cases make government more similar to private business.

In summary, the topics brought forward in this section indicate a certain *loss of control.* Governments do not have full control of their use of information technology because of their reliance of the market and due to the

use of information technology together with other actors. Obviously, this makes it hard to plan many years ahead.

4. WHAT IS E-GOVERNMENT?

Government is not one single thing. Governments are large, complex organisations with myriads of very diversified tasks. Governments are organisations that consist of many "parts" that are managed, funded and organised in different ways, and it is hard to draw a clear line between government and non-government. Given the wide area of application of modern IT, e-government can be seen as a large, complex organisation that uses different kinds of IT, that uses IT ubiquitously, at several levels, and for several different purposes.

Previously, governments used IT mainly for specialised purposes (e.g. calculation of taxes) and mainly for internal purposes. More and more, governments use general-purpose applications of IT (while still using IT for several government-specific purposes). Governments will therefore, to an increasing degree, acquire their software from the market and look more and more like other users of state-of-the-art technology. Current trends towards increased use of IT in governments' relations with citizens (electronic service delivery) is an example of using general-purpose IT, in this case mainly the World Wide Web. As development costs continue to be high, and as the functionality of ready-made software continues to grow, this trend will go on. Thus, e-government is not an island with its own solutions, but a user of state-of-the-art technology that mainly acquires its software and hardware from the market.

Governments use IT more and more in their external relations with citizens, customers, clients, companies and partners nationally and internationally, as well as in internal inter-agency relations. In practice this implies a need for solutions that are interoperable with those of the partners. Choice of technology, functionality and speed of implementation are issues between governments and their partners. Thus, e-government uses technology together with other actors in patterns characterised by mutual dependence, where government is only one part.

Many governments work with public management reform, seeing IT as a driving force, tool or opportunity to achieve desirable changes. Important aims for government reforms are set out in national plans and in documents such as "Government of the Future" (OECD 2000). For the purposes of this discussion, e-government is a modernised, well-managed government still working to improve its way of operation.

Governments are different and so are their goals with public management reform and with the use of IT. Specifically, management and co-ordination practices vary widely from governments with independent arms-length agencies and a weak centre to governments with rather tight, central control (Eriksen 2001, Pollitt and Bouckaert 2000). Thus, there will be differences between governments as to what are acceptable and effective means for co-ordinating e-government initiatives. In a discussion of co-ordination of e-government it is worth noting, however, that acquisition of ready-made software *and* interdependent use of IT in relations with external partners may have a strong co-ordinating effect on e-government. This typically happens when standards, e.g. SMTP for e-mail or http for Web, are firmly established or when commercial products like Microsoft Word take all in a tippy market. Irrespective of government policies, the practical benefits of using the same software as most external partners are very compelling. Outsourcing of IT-services may also streamline the governmental application portfolio.

On a practical level, the ability to implement e-government initiatives is crucial (OECD 2001b). Information technology projects may be hard to plan and there is often considerable uncertainty and risk involved. As a result, it is hard to budget projects within conventional budget processes. One key approach is to divide the projects in smaller, separately useful deliverables, thus reducing uncertainty significantly.

In a context where we emphasize co-ordination, the strengths and weaknesses of project work need to be understood. A project is a one-time organisation with a specific aim. A good project focuses strictly on its aim, stimulating motivation and creativity to work in one direction. Productive project work may, as a consequence, be in conflict with broader ownership of the project's results and with the general aims of the organisation. A broader range of views in the project group may increase support for the results, at the expense of productivity in the project. This price may be worth paying, given the typical problems with a line organisation being in opposition to the results of the project (Sørgaard et al. 1997). This line of thinking is in a sense an application of Keen's (1981) strategy for countering counter-implementation. Getting projects to address issues beyond their own scope requires a certain level of professionalism and maturity in the projects. In the Capability Maturity Model (Humphrey 1989) such concerns are mainly addressed at levels three and above, considering good competence and adequate project management as prerequisites to taking inter-project issues on board.

Finally, there is a need to address the post-development work of implementing the changes in the organisation so that the expected benefits of the new solutions actually can become real. There are several reasons for

this. Often too little attention is paid to training (Star and Ruhleder's (1996) level one). In some cases, managers and other key personnel do not follow up use of the new solutions in practice (level two). Sometimes, use of the solutions is logically connected to a political or cultural process that has not yet found its resolution (level three). The assumption that structure and technology alone will solve the problem is a common one. Moreover, such an assumption may appear very appealing to managers with many other problems on their agenda, without any good ideas for handling the problem at hand, and with money to fund a project postponing other approaches to the problem. As an example, an agency may struggle with its procedures and "production line" for web publishing. This may be a difficult topic, as it involves topics on several levels, like technicalities of getting access to the right programs and directories (level one), misfit between involved technologies and inadequate document formats for electronic publishing (level two), and conflicts about control over the web-service and the agency's information policy and responsiveness to users in general (level three). Instead of entering such a myriad of issues, it may be appealing to fund an ambitious technical project that promises to solve all problems related to electronic publishing. In a sense, such a move represents an attempt (usually futile) at handling a level three issue as if it were an issue at level one or two.

5. MANAGING E-GOVERNMENT

In several countries, central initiatives have been launched to stimulate the emergence of e-government. Without, at this point, looking into the motivations of such initiatives, such initiatives and the importance of IT put the issue of managing e-government on the agenda.

5.1 Managing Risk

IT has often caused trouble for management. The.problem of failed or vastly overrun projects is common, both in public and private sector (Oz 1994, Willcocks 1991). As a consequence OECD has made a separate policy brief on IT investments, drawing attention to issues of realism in ambitions, funding mechanisms and risk drivers (OECD 2001b).

In the analyses behind this paper, several government initiatives, mainly from Norway and Finland, but also from other countries, have been studied. There are many initiatives with excellent purposes, their goals rooted in the political aims of government, but with unrealistic ambitions and risk levels that were never really estimated.

One approach to deal with this issue, interpreted at Star and Ruhleder's level two, is to look at this as a problem of funding and competence: The government administrations' competence and capacity to handle IT issues should be assessed and, if needed, increased. Control mechanisms and review procedures should be introduced to avoid projects that lead to financial loss or failure to meet political goals. Such measures will have serious impact on work with e-government, as plans and projects ought to be screened according to the risks taken and the government's ability to run the projects and implement the results. Some apparently exciting projects may not be acceptable if screened this way. The projects that do get funding may have a reasonable chance of success. This is probably more important than launching flagship projects of high symbolic value.

Another approach, now at Star and Ruhleder's level three, is connected to the discussions on the relationship between ministers (and other political leaders) and their administrations, specifically on the impact of implementation issues on the policies. This is a delicate issue, as it is an important democratic principle that the minister, and not the bureaucracy, should be in charge. As governments often lack experience and professionalism in conducting large IT-projects, well-grounded assessments of the realism of apparently sensible proposals are hard to make. Giving room to implementation issues may be hard in many situations in government, and lack of IT-competence makes it even harder. Moreover, politicians often have a desire to achieve results within their period in office, a desire that may lead to political deadlines rather than deadlines based on sound estimates. Accelerated plans are a well-known risk driver and even a factor causing delays (Boehm 1981). This situation calls for restraint and carefulness. It appears, however, that administrations find it difficult to criticise policies and warn against "hopeless" projects, and sometimes administrations apparently feed politicians with unrealistic proposals.

5.2 Nature of Management Involvement

Within the Norwegian government, there has been an important shift from central control over IT (or EDP) in the 60ies and 70ies to a much more decentralised policy after that. The major reason for central control was cost control and a focus on economies of scale, making common investments in large mainframes a very sensible policy. The instruments put in place were also used, however, to support the national computer industry. Early in the 80ies a major shift towards delegated responsibility for IT took place. The main argument was that in order to ensure responsible investments and adequate fit with each organisation's needs, the financial and managerial responsibility for IT had to be within the line organisation. This policy has

essentially remained stable since then, although several initiatives for stronger central control have been launched.

The shift from centralised to decentralised control over IT reflects the change of computing from being a narrow-purpose, high-cost activity with well-defined and remote relations to the rest of the organisation; to a general-purpose, ubiquitous phenomenon, deeply integrated in the organisation and used by everyone. The normalisation of IT will therefore go hand in hand with a normalisation of the way IT is managed. Delegation and local responsibility are good managerial practices, and well in line with organisational designs which can handle complexity and uncertainty (Galbraith 1973, Mintzberg 1983). From a practical point of view, the issue is quite simple: if we want management in an organisation to act responsibly in relation to IT and uses thereof, management must have relevant decision power over IT in their own organisation. This principle needs some clarification:

- It reflects the approach to IT taken by a mature user organisation. It was of little relevance when IT was new and special, but as more and more tasks are fulfilled with the use of IT and more and more issues are connected to IT, its relevance is increasing.
- It puts a new burden on management. Since the way things are done is very much a question of the kind of IT and the way it is used, effective management will sometimes have to deal with practical and technical IT issues. For managers with little experience with IT and with little time to learn, this may be hard to handle.
- If we fail to observe this principle, management may tend to ignore IT issues or "abdicate" with respect to IT. Should this happen, it will have serious negative consequences for the organisation's commitment to use IT productively and its ability to handle complicated issues, i.e. level three issues, related to IT. Observe, however, that we may get a sort of unspoken, unholy and unproductive alliance between IT-adverse managers in agencies and overly active, central IT co-ordinators.
- The principle does by no means rule out the need for co-ordination of IT, but may have implications for how to do co-ordination work. Top-down IT co-ordination that ignores the responsibility of local management will clearly be in conflict with this principle. On the other hand, co-ordination may take place with otherwise approved mechanisms of co-ordination, giving management the control needed.
- Local decision power over IT does not mean that every organisation makes its own choices and solutions. Many aspects of IT are determined by global technology development, expectations of partners, users, etc., severely limiting the freedom of choice of local decision-makers.

5.3 E-government as Infrastructure

E-government is closely related to issues of information infrastructure for government. Electronic service delivery and notions like "24/7" (service 24 hours a day, 7 days a week) would not be relevant if citizens were not using Internet and the World Wide Web. Hence e-government is sunk into practices and shaped by diffusion patterns of various technologies in ways that are not controlled by government, exactly as described in Ciborra et al's (2000) analysis of information infrastructure ("from control to drift").

Often, it is claimed that there is nothing special with IT, "it's just a tool". Seeing e-government as infrastructure may serve to stress that IT has a different role, not only in terms of our difficulties in dealing with it or controlling it, but also as a mix of technical and cultural "stuff" that to some extent set the conditions not only for how we can work but also for what we can sensibly do.

Star's and Ruhleder's (1996) discussion of the nature of infrastructure is useful to help understand efforts to extend or further develop e-government or government IT-infrastructure. "Infrastructure in use" must be addressed and the issues that typically reveal themselves in such change processes should be handled. Although, at a macro level, IT is an actor with strong impact on government, this view is too coarse to be applied in each project or in each governmental reform. Critical empirical work with analyses similar to those of Star and Ruhleder may give input for realistic agendas for change.

6. CO-ORDINATING E-GOVERNMENT

6.1 Setting Ambitions Right

There is every reason to discuss the need for co-ordination of e-government. Not because co-ordination should be avoided, but because co-ordination is demanding. There are immediate costs of co-ordination in terms of time, money and manpower. There are diffuse costs of co-ordination in terms of a tighter web of regulations and requirements to which new, creative initiatives must adhere and in terms of management and control structures that may be incompatible with central principles on autonomy and delegation. There are inflexibilities and vulnerabilities (and risks) connected to co-ordination when the same principles are to be practiced in a highly varied context and with different actors (Braa and Hanseth 2000, Hanseth et al. 2001).

Apparently, it is too easy to call for more co-ordination or to endorse government standards. It is relatively simple to highlight the benefits of common solutions. Moreover, taking initiative and getting things straight have an appeal to many. In sum, co-ordination may almost always sound plausible. Or, in the words of Eisenhardt and Galunic (2000): "A cornerstone [...] is letting heads of business units determine where and when to collaborate. If corporate managers take the lead, they often do not understand the nuances of the business. They naively see synergies that aren't there. They tend to overestimate the benefits of collaboration and underestimate its costs."

Often, the technological uncertainties and commercial dependencies with respect to certain technical choices are not well understood. As an example, government backing for standards like X.400 for e-mail and UN/EDIFACT for data interchange was very strong in some countries. Behind this support there were assumptions about the nature of technology development and diffusion that, at least with the wisdom of afterthought, appear to be unrealistic. Indeed, whenever initiatives for co-ordinated backing of specific technologies are proposed, one should critically ask: "How to know that this is the right technology?" The risk levels of such initiatives are often not well understood. Strong backing of the "wrong" standard may lead to voluminous erroneous investments. Extreme care should therefore be exercised in using the government's acquisition power in a standardisation battle.

The inflexibility that may come as results of tight standards is hard to communicate. Top-level managers and IT co-ordinators may be unaware of the vast differences in work situations, use patterns, needs for computing support, dependencies of other solutions, etc. that make common solutions less practical than what they appear to be. Tight IT co-ordination is hard in private corporations with a fairly narrow set of products and services. Most governments are much more diversified in their range of products and services than any private company. A government may run jails, hospitals, schools, railway-tracks, roads, embassies, police forces, airports, battleships, castles, museums, tax-collection offices, pension schemes, research labs, universities, libraries, churches and ministries. In most of these settings IT is abundant, and the variation in IT-equipment and its uses is enormous. There are not only differences in the products and services, there are also differences in how organisations in government are funded and managed, making common administrative support hard. Moreover, it may be hard to define where government ends and other actors start. Therefore, the government level does not, perhaps with some intelligently picked exceptions, appear to be a sensible level for much IT co-ordination.

In an offensive culture of "doers" it may be unpopular to argue against apparently good initiatives. Some of my informants confirm that the

initiatives they once endorsed, and that later totally failed, seemed very convincing when they were presented to management. If, in addition, there are weak traditions for analysing unsuccessful projects, government may never learn. As a result there is considerable room for seemingly attractive, expensive and highly unrealistic co-ordination initiatives.

Additionally, successful co-ordination does not only require the right central decisions, but it must also be possible to work it out in practice. This requires co-ordination mechanisms that actually work, and that the ambition level is adjusted to what is feasible with the given mechanisms. As previously noted, this requires a certain level of maturity as defined by the Capability Maturity Model (Humphrey 1989).

6.2 Dimensions of IT Co-ordination

In very large organisations like governments or international companies there will be several different constellations where interoperable IT solutions are needed. These define what I will call dimensions of IT co-ordination. In my own work with IT co-ordination in government and in private companies I have identified the following four dimensions:

1. *Co-ordination between local branches within an agency or division.* Large organisations are often organised in independent divisions, for example product divisions or nationwide agencies. Within one such division there may be many similar branch offices. There are large economies of scale in ensuring that all IT development is common to all these branch offices. Common solutions also make it easier to move clients' cases between the offices, and to ensure that similar cases are handled the same way by all branch offices. Centralised management of IT may be a logical way to implement legal requirements as to equal handling of cases in all branch offices. Pursuing this kind of co-ordination reduces local autonomy and local managers' responsibility for the solutions chosen. It puts a very high burden on the central developers' insight into the diversity and changes in needs in the branch offices. Within government, this dimension of IT co-ordination is normally strongly emphasised within nationwide agencies with tight control of their local branch offices, and less emphasised in administrative areas controlled by local government.
2. *Inter-agency or inter-division co-ordination.* Similar applications in different agencies need to work together in order to provide a consistent interface to the citizens (clients). As an example, companies ask for similar or standardised ways of reporting data to different authorities. Some clients of the welfare system need to be handled by more than one agency at the same time. Hagdahl (2002) studied use of IT within a local

initiative to better co-ordinate governmental and municipal agencies involved in vocational rehabilitation. She observed that reduced local autonomy and little technical flexibility made it hard for branch offices of nationwide agencies to participate in such local collaborations. Pursuing inter-agency co-ordination may lead to more integrated services for the citizens, but it may easily come at the expense of internal efficiency in the agencies. The steering mechanisms in public administration are often not well suited to achieve this kind of co-ordination. In work aiming at reducing the burden on businesses from obligations to report various kinds of information like employment, salaries, etc., the Norwegian Directorate of Public Management observed that seemingly similar kinds of information collected by the Norwegian Tax Administration and the National Insurance Administration were determined by legislation and by-laws worked out by different ministries. Discussions with staff in the ministries revealed that they did not realise the full extent of their roles as "managers" of large IT systems. In other words: decisions with major impact on the possibilities for achieving IT co-ordination were made without regard to this issue. This observation points at inherent inefficiencies in the way work is split between the ministries and agencies. There is therefore a need to let IT implementation concerns have an impact on decisions at the ministerial level.

3. *Functional integration.* Within each and every part of an organisation, product divisions, branch offices, sales offices, central administration, etc. there is a need for smooth interoperability between a broad range of applications in order to facilitate automation, reduce repeated registration of the same data, and provide users and customers with smooth services. As an example, electronic service delivery entails integration between services on the World Wide Web, internal case processing systems, client databases and sometimes also authentication systems. Previously independent applications are now tightly integrated. Functional integration may lead to highly automated systems and vastly reduced lead times. The costs are in development and in reduced flexibility.
4. *Co-ordination with external partners.* Increasingly, an organisation's use of IT and its products need to work together with products and services from other suppliers. As an example, governments' use of the World Wide Web and e-mail is largely interdependent with use of the same solutions elsewhere, as is evident in the proliferation of specific proprietary document formats. Another example would be reporting data from small companies, where governments need to find solutions that are easy to implement or are already available on commonly available equipment. Pursuing this kind of co-ordination requires flexibility and

sensitivity to what goes on outside the organisation. Through this kind of mechanism, outside actors like the Internet and large suppliers of hardware and software play an active role in establishing compatible IT solutions also within government. The benefits of this kind of co-ordination are in satisfied clients and in the ability to benefit from ready-made software and cost-effective self-service solutions. The drawbacks are mainly to be found in increased dependence on external actors.

6.3 Practical Mechanisms for Co-ordination

Whatever the conclusion is with respect to the ambitions for co-ordinating e-government, there is also a need to identify and implement mechanism for such co-ordination. Moreover, the nature of these mechanisms, their cost and their effectiveness, need to be taken into account when the ambitions for co-ordination are set.

In 2000, the Finnish Ministry of Finance performed a comparison of IT co-ordination at the central level in the Finish and Norwegian governments (Sørgaard 2000). Norway, at that time, had an IT co-ordination unit within the Ministry of Labour and Government Administration. The unit was relatively well funded but with limited decision power. As a result, the unit funded a series of projects as set out in an action plan for electronic government (AAD 1999). The organisational and political prerequisites for an electronic government and the risk level of the projects were not carefully evaluated. This represented a construction approach to electronic government, i.e. an assumption that a number of centrally funded pilot projects or demonstrators would contribute significantly to the development of electronic government.

Finland has an information management unit within the Ministry of Finance. In 2000 the Finnish Council of Ministers passed a decision in principle about information management in government (Valtioneuvosto 2000) where several goals were set, and, interestingly, several inter-agency co-ordination groups were defined. The Ministry of Finance was named chair of most of these groups. The information management unit does not have strong power, however, nor does it have resources to fund many large projects. This represented a weak co-operation model to co-ordination of e-government.

The Finnish and Norwegian models for development and co-ordination of e-government can be compared with the ministerial structures in the two countries. There appears to be a logical relation between the weak co-operation model and the consensus-oriented style of decision-making in Finland, while the construction approach was simple to implement within the Norwegian system of decision-making by individual ministers. A third

comparison of this kind would be the centralised power of the British e-envoy, and the organisation of the Office of the e-envoy within the Cabinet Office.

The OECD (1996) paper on building policy coherence defines a broad range of policy co-ordination processes, budget co-ordination and policy implementation mechanisms. It warns, however, against relying too heavily on policy making by budget and on the implementation capacity of the centre. As a logical follow-up, the OECD paper also discusses administrative culture, raising topics such as consultation-oriented culture, personnel management policies, and interdisciplinary meetings and shared frameworks of understanding.

Eisenhardt and Galunic (2000) emphasise the need for focused, data oriented meetings between responsible managers. Inspired by them and having regard to the issues above there are many simple, process-oriented, co-ordination mechanisms available:

- There is a need for places to meet for people working with related topics and who want to share information and discuss common professional problems. In its simplest form people organising themselves can implement this. Slightly more ambitious, common seminars and on the job training can provide such meeting places.
- Every systematic attempt to co-ordinate across sectors will need inter-agency bodies that meet, exchange information, discuss and sometimes also make decisions. Given the nature of most governments, such bodies must rely on decision by general consent.
- On a bilateral basis, separate units may use each other to help with quality assurance and reviews of plans, designs, and strategies, etc. This is a lot cheaper than external consultants, and will be useful as plain advice, and also as a way to build competence and mutual awareness of what is going on, preparing for more co-ordinated strategies next time.
- In some governments there are central or common advisory units within the field of administrative development, e.g. the Norwegian Directorate of Public Management. Such units may, without any formal power, work as channels for exchange and accumulation of experience. They may even, through their impressions from different agencies; provide ministerial policy units with valuable observations of the practical problems of e-government implementation. Getting this learning-cycle to work would be very beneficial to policy development. In practice, private consultants will contribute in a similar way to improved co-ordination through their contracts with different agencies. Their feedback to policy units may be limited, however.
- Within a government based on the directorate model (arms length agencies), the ministries may have considerable room with respect to

how they govern and follow up their subordinate agencies. If the only concerns raised in these steering and reporting processes are sector-specific issues, the agencies will most likely behave accordingly. If, however, these processes address the agencies' contributions to crosscutting policy issues, more co-ordinated performance can be achieved.

- Within the classical bureaucracy people may experience that the only behaviour that really pays off in terms of career is narrow focus on sector-oriented goals, in spite of a general rhetoric supporting co-ordination. Evidently, career and money count more than rhetoric, and therefore governments that want to strengthen crosscutting policies in general and consistent approaches to e-government in particular need to address personnel management and cultural issues within the bureaucracy.
- Finally, once personnel management is seen as a part of the implementation of the policies, systematic exchange and rotation of personnel, inter-ministry career plans, etc. can be implemented.

6.4 Discussion

The four dimensions of IT-co-ordination in section 6.2 are all relevant for the co-ordination of e-government, and all four have their benefits and costs. Each and every concern for co-ordination results in a set of requirements and restrictions that need to be observed in further development work, resulting in higher costs and less creativity. As a result, needs for co-ordination must be prioritised, and some needs simply cannot always be taken on board. Among the four dimensions it is obvious that the first dimension (within the agency or the sector) has high priority and is well aligned with management structures. The third dimension (functional integration) must be given priority in order to realise the efficiency potential of IT. The fourth dimension (with external partners) is a necessity today, as a large part of the potential for good use of IT lies here. The dimension that "suffers" will easily be inter-agency co-ordination: the power structure does not strongly support it, it requires changes at a high level in the bureaucracy and the benefits are not as obvious as the benefits of the three other dimensions. If benefits with this dimension are to be achieved at the expense of other benefits, the case for this kind of co-ordination is weak.

This issue has a direct relation to the dilemma in organisational design (and government reform) of co-ordination vs. use of autonomous agencies (Pollitt and Bouckaert 2000, pp. 165–166). This dilemma is, in my experience, rarely touched upon in policy documents on e-government. An important and elegantly formulated example to the contrary can be found in

a decision by the Finnish Council of Ministers: "a basic problem is how the agencies' responsibility for results and autonomous operation can be retained while at the same time ensuring the interests of the government administration at large in questions pertaining to interoperable systems and shared use of information resources" (Valtioneuvosto 2000, author's translation from p. 14 in the Swedish version). Much money could be saved and more real progress would be made in efforts with e-government, if this dilemma was understood and paid attention to in plans and strategies for e-government. The inherent contradictions in this field rule out easy solutions. Efforts on IT co-ordination across sectors must be strictly prioritised, with due attention to costs and negative side effects.

Section 6.3 points at a set of weak co-ordination mechanisms that may be implemented at low cost. The clue with those mechanisms is to avoid putting too much responsibility for co-ordination on the already over-burdened centre of government. Instead, various incentives, weak mechanisms and pieces of culture can be put in place to create an organisation which, when needed, is more likely to search for co-ordination of solutions at its own initiative. If mechanisms of this kind are not in place, co-ordination from above may easily fail. In my experience, there is relatively little emphasis on such practical mechanisms for co-ordination, with the Finnish inter-agency co-ordination groups as a notable exception. Within the framework of Star and Ruhleder (1996) this discrepancy may find an interpretation as a third-level issue. Some of the central plans for co-ordination can be seen as political initiatives of symbolic value or as expressions of inter-ministerial power struggles. It would be naïve to assume that such issues are absent, and even the most well intended attempt at achieving co-ordination might meet suspicions and resistance. A practical agenda for co-ordination of e-government will therefore need to use mechanisms that do not get interpreted as an attempt at grabbing power from some co-ordination unit.

There are several reasons to show care in finding a realistic level of ambitions with respect to co-ordinations of e-government. Yet, there are important successful examples that need to be recognised. Both Finland and Norway have had important benefits from well-defined personal ID-numbers. Norway has had success with a common exchange format called NOARK for mail records (i.e. data records describing correspondence to or from government). The Finnish Ministry of the Interior heads a working group on data formats, and the working group maintain a web page with agreed formats, ready to use for system developers within as well as outside public administration. Defining data for core government topics is a task for government, and is often implicitly done as part of the ministries' work with by-laws for various administrative areas. Difficulties arise, of course, when different ministries work with by-laws for overlapping issues.

7. CONCLUSIONS

First of all it appears that the difficulties of co-ordinating e-government are underestimated. Although the case for inter-agency co-ordination is strong, the analysis shows that other dimensions of co-ordination will receive more attention. The differences within government are very large. Governments should therefore check their ambitions and prioritise goals with crosscutting co-ordination carefully. The three-level framework of Star and Ruhleder (1996) may be useful in selecting realistic projects. It is also evident that a lot of practical co-ordination has taken place through the ongoing standardisation in the software market. The aim of providing services to companies and citizens will most likely further increase the use of generally available (commercial software or freeware) solutions.

There are viable, practical alternatives to pursue co-ordination of e-government. These may be "low-key" mechanisms, but they will improve the foundation for co-ordination in the future. Little emphasis on such simpler mechanisms indicate that the agenda behind many co-ordination initiatives is more of a political or symbolic nature, and that explanations are to be found in inter-ministerial power relations.

If, however, there is a sincere interest in improving co-ordination of e-government, there are pragmatic alternatives available. Since co-ordination requires development projects to address concerns beyond their own mandates, there is a need to increase the maturity (cf. the Capability Maturity Model) of governments as software organisations in order to increase the likelihood of successful co-ordination.

Differences between countries are large. It is worth asking to what extent countries with highly different traditions for governmental decision-making can learn from each other when it comes to co-ordination of e-government. The British model with an e-envoy may, for example, be successful there, but may fit less well in a structure with more independent ministries like in Norway and Denmark. Further studies and critical evaluation of experiences are needed to approach this question.

Issues of implementing e-government in general, and of achieving desired co-ordination in particular, address the split of work between ministries and agencies, and between politics and administration. From a systems development point of view there is a need to let implementation issues have increased impact on policies and goals that today are defined in ministries. This is needed in order to achieve a situation where governments learn from the experiences of previous projects and co-ordination initiatives. The current split of concerns between ministries and agencies may inhibit the successful adoption of information technology in government. There are considerable challenges in finding ways to manage information technology

in government that create the best foundation for using the technology, while at the same time addressing issues of co-ordination and need for democratic political control.

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Chapter 5

TRANSLATIONS IN NETWORK CONFIGURATIONS

A Case Study of System Implementation in a Hospital

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Abstract: This paper reports from an interpretive case study in a hospital of the replacement of paper based order forms for radiology examinations with web based order forms. The aim is to contribute with a better understanding about the implementation of networked technologies in healthcare. The case shows how the implementation of network technology imposes a configuration in the actor-network and illustrates the importance of small steps and translations involving many different actors in the process leading to a new stabilized configuration.

Key words: implementation, adoption, network configuration, translation, healthcare

1. INTRODUCTION

The healthcare sector has invested large sums of money in information and communication technology (ICT), often with little satisfaction (Heeks & Davies, 1999). However, the conviction of the potential benefits of ICTs in healthcare remains strong, and is based on the knowledge and information intensive characteristics of health organizations. This tension between the potential benefits and actual outcomes is the primary motivation for this study of the implementation of a networked technology in a healthcare unit.

Lyytinen and Damsgaard (2001) have examined common conjectures when diffusion of innovation theory is applied for analyzing networked

technologies. They suggest that history helps us understand important process features and the role played by key actors. They also recognize the need for developing "multi-layered theories of diffusion that factor out mappings between layers and locales" (p. 186), and the need to "use alternative theoretical perspectives that can help extend analysis beyond questions of efficient choice" (p. 186). We acknowledge these research directions as theoretical guidelines for our study of implementation practices.

Our understanding of ICT implementation is based on Swanson's (2001) concept of innovation processes as a story having four phases: comprehension, adoption, implementation, and assimilation. Specifically we consider the adoption and implementation phase, and focus on the latter since our story begins when the decision to adopt the new technology was already made. The adoption phase concerns decisions about "why to adopt the innovation?" and "when is the right time to do it?" The implementation phase is about "when and how is the implementation to be accomplished?"

The primary actors, managers and end-users, in these phases have different interests in the process and they are not autonomous in their choice of adopting or rejecting an innovation (Gallivan, 2001). Gallivan argues that, in organizations, the conditions for decision are defined as "contingent authority innovation decisions" in which "authorities make the initial decision to adopt and targeted users have few alternatives but to adopt the innovation and make the necessary adjustments for using it to perform their jobs" (p. 52). After this non-voluntary adoption phase (Gallivan, 2001), future users deal with the innovation as the new configuration meets current work practices. How this unfolds in organizational settings has been extensively studied from various perspectives, for example as re-invention (Rogers, 1995), care (Ciborra, 1996), sense making (Henfridsson, 1999), formative contexts (Ciborra and Lanzara, 1994), or as situated change (Orlikowski, 1996). These studies provide a rich understanding of the challenges involved in transforming organizations with networked technologies, but our knowledge about the reactions of and interactions between different stakeholders during system implementation remains limited. Also, there are no extensive case studies available from the healthcare sector about implementation of contemporary networked technologies.

Our primary aim is to contribute with a deeper understanding of implementations of networked technologies in healthcare. When a new network technology comes into the picture a certain configuration is imposed on the existing socio-technical network. We analyze how the socio-technical relations start to change in terms of small steps of negotiations and translations involving various groups of actors. We argue that this dynamics

have important consequences for how work practices sustain, are challenged, and are transformed.

The following section outlines the method adopted for data collection, and section three describes the case study. Subsequently, in section four, we review the existing literature on implementation of networked technologies in organizational settings and we introduce the theoretical lenses for the analysis. The empirical material is presented and analyzed in sections five and six. Finally, we discuss the contribution of our research in relation to the existing literature and we outline some implications of our findings.

2. METHOD

We report from an ongoing interpretive case study (Walsham, 1993; 1995) in a large Swedish hospital. The study focuses on a change process involving replacement of paper based order forms for radiology examinations with electronic order forms. We focus on the following research question:

> What is the role of negotiations and translations between different groups of stakeholders when new network configurations are introduced to change current work practices?

A combination of different qualitative techniques for data collection have been used; observations of daily work, interviews, meetings and seminars, study of documents and the ICT system, and continuous informal discussions with the project managers as well as care professionals. Different professions involved in the clinical work have been considered; physicians, nurses, assistant nurses and secretaries with different responsibilities.

The data collection started in October 2001 by participating at the first project meeting for the order form system. During autumn 2001 and spring 2002, we participated in 10 project meetings, each lasting about two to three hours. In May 2002 a first version of the system was implemented at the orthopaedic clinic. During May, June and September 2002 we spent forty hours of observation of daily work at the different departments and professions at the clinic. Between February and May 2003, twelve semi-structured interviews, 30-90 minutes long, were conducted, covering questions of how the users perceived the system and its impact on their work practice.

In the analyses of the case we aim to understand the complex relations among different types of elements, e.g. information, people, work practices,

and ICT's, involved in the adoption process and to study the evolution of these relations over time. We do this by adopting relevant concepts from Actor Network Theory (ANT) (e.g. Latour, 1987) as analytical tools. There are several reasons for adopting this particular theoretical lens. Firstly, ANT has proven useful for analyzing socio-technical relations in heterogeneous networks (e.g. Aanestad, 2003; Akrich, 1992; Hanseth & Monteiro, 1997). Secondly, ANT offers concepts like network configuration, negotiation and translation that help us focus on how various actors deal with the dynamics involved in going from one set of work practices to a new set enabled by the new order form system (Law, 1999). Thirdly, ANT does not make any particular assumptions about the organizational context of the implementation process in question. This allows us to focus on different network sizes and to adopt different levels of granularity (Hanseth & Monteiro, 1997).

3. THE CASE

The implementation process unfolds in a Swedish emergency hospital, a limited corporation owned by the county council serving approximately 360,000 inhabitants. The decision to implement the new electronic order form hospital wide was made at the top level by the hospital director and managers from the different clinics. The IT unit at the hospital acted as project manager for the implementation and for the overall digitalization of the radiology department. A small external company developed the web based order form system, including the radiology information system (RIS). The picture archiving communication system (PACS) storing relevant images was purchased as a standard system.

The digitalization of the radiology department is part of an ongoing modernization process in Swedish hospitals. The process implies, in this case, the implementation of RIS and PACS within the radiology department and the adoption of the electronic order form system connecting the radiology department to all clinics. The electronic order form system is expected to benefit the hospital as a whole as well as the radiology department. Specifically, it should lead to improved access and timesaving for searching after lost and misplaced documents.

4. THEORY

Previous research in the area of implementation of network technologies in organizations points out the main challenges involved and suggests

different analytical concepts for their interpretation. Ciborra (1996) identifies three interrelated elements in an implementation process: the human organization, the system, and the context. He argues that to reach an effective implementation it is necessary that the members of the human organization express a great amount of care to incorporate the new system into their daily work life. To reach a full appropriation of the system, the involved actors should engage actively to cope with the involved uncertainties and not rely on a passive detached process of acknowledgment (Ciborra, 1996). Henfridsson (1999) proposes a sense making perspective for understanding ICT adaptation in organizations. He proposes to focus on the dynamics in the sense making process. The main assumption is that it is through people's active production and assignment of meanings to ICT that systems become useful in specific organizational contexts. Ciborra and Lanzara (1994) explore a perspective centered on human action pointing at the importance of the formative contexts. They refer to formative context as "the pre-existing institutional arrangements, cognitive frames and imageries that actors bring and routinely enact in a situation of action" (p. 70). These institutional arrangements play a crucial role in shaping the way routines are formed and given specific meanings. Orlikowski (1996) conceptualizes the ICT implementation process as a result of social actors' anticipations, expectations, and enactments of emerging patterns of use and exploitation of up-coming opportunities. Finally, Rogers (1995) explores the concept of reinvention focusing at how an ICT innovation is modified by users during implementation. He points out that implementing a new technology is not a passive process, but implies a decision to make full use of an existing idea.

These contributions agree that network implementation processes are highly complex and demanding, and that the involved actors need to actively engage in and contribute to the adoption of the new system and to the transformation of current work practices. This literature also provides a rich array of interpretations of why this is the case and of the different kinds of enablers and barriers that exist to make the implementation happen. Building on these findings we adopt ANT to analyze specifically how different actors become engaged as current work practices are confronted with a new system. ANT develops from the idea that entities take their form and acquires their attributes as a result of their relations with other entities (Law, 1999). In this scheme entities have no inherent qualities as being large or small, human or non human etc, but rather as Law points out such divisions or distinctions are understood as effects or outcomes. They achieve their form as a consequence of the relations in which they are located.

We use two concepts from ANT as the key theoretical lenses in our analysis: network configuration and translation. A network configuration refers to how an actor-network is 'displayed'. Aanestad (2003) suggests

conceptualizing design work of networked technologies as *design of network configurations* pointing at the materially heterogeneous elements in networks. The work of configuring a network refers then to the alignment performed by all actors involved in the network, and calls for a detailed examination of the strategies, which enlist bodies, materials, discourses, techniques, feelings, laws, and organizations. This concept allows us to see how actors influence the configuration, and how the configuration itself is fundamentally relational.

The way an actor-network is configured is the outcome of how actors play their roles and succeed in translating their interests, or inscribing them into pieces of technologies. Callon and Latour (1981) define translation stressing the uneasiness of such process: "By translation we understand all the negotiations, intrigues, calculations, acts of persuasion and violence, thanks to which an actor or force takes, or causes to be conferred on itself, authority to speak or act on behalf of another actor or force" (p. 279). Accordingly, Akrich (1992) suggests that if we want to describe the elementary mechanisms of reciprocal adjustment between the technical object and its environment" we need to find disagreement, negotiations, and the potential for breakdown" (p. 207). Too often configurations are perceived natural as if there was never a possibility that they could have been otherwise (Akrich, 1992). In line with Akrich, we believe in the importance of following each movement leading to a new stabilized configuration.

5. THE IMPLEMENTATION PROCESS

This section describes the implementation process that was initiated as a pilot project at the orthopaedic clinic. We also discuss the integration into the existing infrastructure and the management of the change process. Figure 1 provides a chronology of key events during this implementation of the new order form system at the orthopaedic clinic.

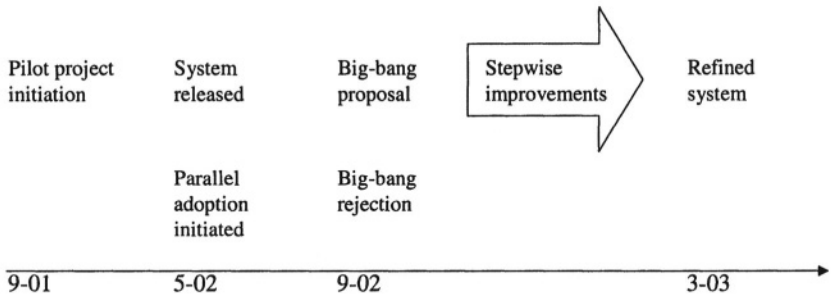

Figure 1. Key Events during System Implementation

5.1 Pilot Implementation

The order form implementation started with a 'Pilot project initiation' (see Figure 1) where a group of various care professionals representing the orthopaedic clinic was formed in September 2001. The group analyzed current routines and information flows and prepared the clinic for the new system. Insights from the group served as input to the detailed design of the system.

An issue that was intensively discussed in the project was whether physicians should write order forms themselves after the system was implemented. In the paper-based routines, the order form was structured with various fields to fill in and sent through a pneumatic tube system within the hospital. Traditionally, all preparations to gather relevant documents where conducted by archive personnel, secretaries, assistant nurses and nurses. Nurses or secretaries would also check that sufficient data were filled in before an order form was sent. Physicians expressed being quite happy with the existing paper based system and the pneumatic tube system. Nurses and secretaries experienced some difficulties searching for lost and misplaced documents.

The first physician representative in the project was relatively uncommitted to the project group and did not always show up. In general the representatives expressed difficulties to find time to participate in the project, and others also missed meetings occasionally.

A second physician was invited to the project group to increase participation from his professional group. The physicians' interest was mostly focused on sustaining the existing support they had from the other professional groups. They expressed worries about spending time to do what

nurses or secretaries were now doing. They also pointed to quality concerns in relation to patients, as their time for visits would decrease.

The nurses' interest was favourable to the transfer of tasks to physicians. They regarded those tasks as being the physicians' responsibilities: according to hospital regulations a radiology examination needed to be requested and signed by a physician. However, in the paper based routines this was often delegated to nurses. The nurses' expressed that sometimes the situation really required them to support the physician, but sometimes it was more of a matter issue. Therefore, the nurses wanted to clarify responsibilities. The secretaries expressed their concern to maintain the responsibility to write order forms from dictations. In the final design of the system, only physicians were authorized to write an order form in the system, while other professionals were authorized to read.

5.2 Integrating into existing infrastructure

The existing infrastructure at the hospital included shared systems concerning the safety system utilizing a personal key infrastructure (PKI), the operating system Windows NT4, the existing Electronic Patient Record system (EPR) Melior by Siemens, plus a number of different local systems at the different clinics. The system was implemented (see 'System released' Figure 1) at the pilot clinic in May 2002. The relationships between key network components and organizational units are illustrated in Figure 2. The system was set up with access via the EPR requiring the user to logon to the network, the EPR and then start the web-based order form.

The management's arguments for implementing the order form system into the existing information infrastructure with access via the EPR was related to safety issues, and the intention to make the user perceive the EPR and the order form system as one system.

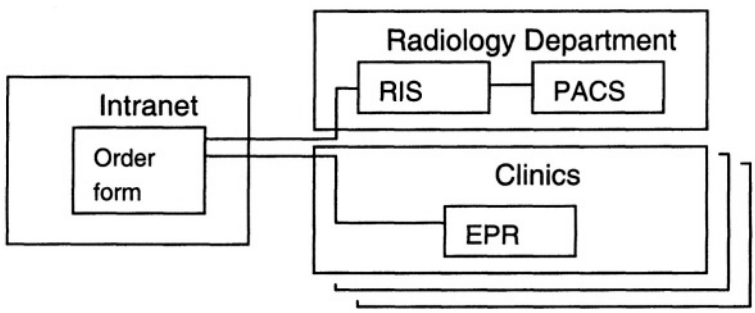

Figure 2. The Relationships between Key Network Components and Organizational Units

A 'Parallel adoption' strategy was initiated (see Figure 1) where the existing paper-based and new electronic order systems were in use at the same time. In relation to the 'System release' (see Figure 1), another physician became involved at his own initiative. That physician was an enthusiast, and started actively to engage in the project group providing viewpoints and constructive comments on how to improve and further develop the new system. The order form system required the user to fill in the form according to fixed rules, e.g. certain fields are compulsory to fill in; and certain fields are compulsory to fill in by choosing from a list of possible examinations, aiming to generate more accurate order forms. The physicians did not particularly like to use the new system, and tried to sustain the paper-based routine. The assistant nurses and nurses therefore removed the paper forms in order to make the physicians use the system.

The physicians perceived the system as being unsatisfactory, mainly due to stability and performance problems. They were also concerned with the exclusion of secretaries and nurses authorization to write a request that made their tasks so unacceptably time consuming. The enthusiast physician gathered the collective experiences among the colleagues and acted to gain support from the nurses and secretaries.

5.3 Management of the change process

Even though the order form system was a hospital concern, decided by the board of the hospital, it was conducted as part of the larger digitalization project of the radiology department. Project management experienced a lack of commitment from the hospital management in informing the involved stakeholders about the project. Most users consequently perceived the project as a radiology concern rather than a hospital wide concern. During the process, the project managers realized it would have been better to separate the order form project to clarify that it was a concern for the hospital as a whole.

The perception of the implemented system varied among the users, but there was a shared opinion that the system was too slow and unstable in the current state. The project managers knew that there were problems with both performance and stability, and they were continuously working with improvements. However, they were not aware of the magnitude of the perceived shortcomings and planned to perform a hospital wide implementation during the autumn of 2002 (see 'Big-bang proposal' in Figure 1). In September 2002, when this became clear among the users they reacted strongly with a requests to stop other implementation efforts until the system had been sufficiently improved (see 'Big-bang rejection' in Figure 1). As a result, the hospital wide implementation was postponed. Meanwhile,

the pilot clinic carried on using the system, although in parallel with the old paper based system as a back up when necessary.

Three main problem areas were identified in relation to performance and stability of the system and efforts were made to improve these (see 'Stepwise improvements' in Figure 1). One problem identified was related to an oracle database in RIS, which needed to be replaced with another version. Another problem had to do with the standard system PACS. This problem was solved when the supplier launched a new version. A third problem was related to programming improvements in terms of data manipulation in various lists and logical issues in the algorithms of the order form system. In addition, changes were made to the user interface based on user viewpoints. Due to the perceived cumbersome and time-consuming sequence of actions to access the order form, the users acted for an alternative access. This was made available directly to the system from the hospital intranet. In March 2003 a more 'Refined system' (see Figure 1) was in use.

6. UNFOLDING CONFIGURATIONS

In this section we analyze the dynamics involved in the transformation of the network configuration at the orthopaedic clinic. In particular we emphasize the translations enacted by the key stakeholders to understand better how the emerging work practices were negotiated in a step-by-step fashion.

6.1 The Partial Network

Even though the paper-based form was highly structured, the use of pen and paper provided a certain degree of flexibility. The form itself had no embedded inscriptions limiting the process; it was the human actors in the actor-network that would be translators of the agreed rules. The paper form provided unlimited access to the actor-network allowing the physicians to often rely on assistance to perform their task.

When this established configuration was confronted with the new actor, the order form system, performances were restricted to stronger predetermined rules. The embedded inscriptions in the new system required the user to fill in the form according to fixed rules. Further, only physicians were enabled to write a request. The inscriptions mediated the imposition of this new network configuration. In the previous configuration the actors could perform the task of ordering an examination in an 'ad hoc' manner as a result of the specific interpretations and negotiations between the actors involved in a given situation. This traditional work practice was now

translated into a configuration with a more constrained relation between the physician and the order form system. As a result, the physicians perceived their work situation as more difficult. They now had to perform the task single-handed.

The imposed socio-technical network configuration was the result of a translation that occurred as a result of tensions between the roles of nurses and physicians. In the translation process, the nurses made an active effort to embed their interest and concerns in the design of the system. The original flexibility of the established cooperative pattern was now constrained by the embedded inscriptions in the new system.

The physicians were initially rather passively observing the implementation process but later they complained in several ways and with increasing force that their work tasks were becoming unacceptably time consuming. Due to their strong reaction, the hospital wide implementation of the system was postponed. Moreover, the embedded inscriptions in the system and the routines were changed to reintroduce a certain degree of flexibility. Thus, both nurses and secretaries were enabled to write requests (on delegation) in order to assist physicians in certain situations.

We have summarized the key negotiations and translations enacted by the different groups of users in the orthopaedic clinic during systems implementation in Table 1. The table highlights the dynamics involved as the users deal with the challenges involved in transforming their work practices.

Table 1 Key Negotiations and Translations in the Orthopaedic Clinic

Physicians	Nurses	Others
Traditionally assisted by secretaries, assistant nurses and nurses Initially disinterested in project Exercise increasing influence to avoid emerging configuration Regain assistance from secretaries, assistant nurses and nurses	Traditionally executing physicians' responsibilities Active during project initiation Successfully transfer responsibilities to physicians Eventually assist physicians in executing responsibilities	Traditionally responsible for writing down dictations Active during project initiation Eventually sustain the responsibility to write from dictations

6.2 The Extended Network

We then zoom out from the work practices and the changes by the new system. Instead we consider the system as an actor in a larger actor network to understand how these higher level dynamics also influenced the resulting

network configuration. The system was part of a larger infrastructure with other elements that need to be taken into consideration.

To separate the constraints perceived by the information infrastructure as a whole and the order form system is difficult. There was an apparent relation between the perceived use of the system and the logon process to the network for the users. The information infrastructure (PKI, Windows NT4, and access via the EPR) created a sequence of activities to access the order form that were perceived as cumbersome and time consuming, which naturally influenced the overall perception of the order form system.

The configuration of the information infrastructure exemplifies a translation of overarching interests that influenced the configuration for the partial network at the orthopaedic clinic. The implementation of the order form system into the existing information infrastructure illustrates how overarching or specific interests were translated to the semi-autonomous orthopaedic clinic. Due to the perceived cumbersome and time-consuming sequence of actions to access the order form these interactions meant that an alternative access was eventually made available directly to the system from the hospital intranet.

We have summarized the key negotiations and translations enacted by key stakeholders on this level in Table 2. The table highlights the dynamics involved as these groups negotiated and renegotiated the ways in which the new system should be configured and integrated with existing work practices and infrastructures.

Table 2 Key Negotiations and Translations in the Wider Context

Project management	Hospital management	Orthopaedic clinic
Focused on getting the system implemented and used Focused on progress and on maintaining the system	Focused on safety issues Wanted network components to be perceived as one system	Promoted functional issues Required improvements Stopped hospital wide implementation Required alternative access point to the system

7. DISCUSSION AND CONCLUDING REMARKS

Our research contributes to the literature on ICT implementation in organizational contexts. Previous research has pointed out that it is difficult to transfer technology from one context and culture to another and that there is a need for small steps and translations in such processes (Akrich, 1992). Our case study shows that this also applies to contexts that are not far apart, i.e. within the same hospital.

The case confirms the necessity for the involved actors to exercise a great amount of care to incorporate the new system into their daily work life, as argued by Ciborra (1996). However, our study points to difficulties involved in making this happen due to differences amongst stakeholder. The care expressed by the physicians, the nurses and the secretaries to incorporate the new system into their daily life appeared as a series of negotiations as the new system met work practices. Similarly, there were negotiations and translations going on between the different management levels of the hospital, the project, and the orthopaedic clinic.

The sense making perspective (Henfridsson, 1999) also applies to this case, but the way in which different actors made sense of the new system varied depending on their interests, the negotiations with other stakeholders, as well as the underlying formative context of the implementation process (Ciborra & Lanzara, 1994). The case shows how routines are shaped and reshaped as the involved actors develop specific meanings of the emerging network configuration.

The considered literature (Ciborra, 1996; Henfridsson, 1999; Ciborra & Lanzara, 1994; Rogers, 1995; Orlikowski, 1996) points out the complexity and dynamics of network implementation processes. It emphasizes in particular the need for actors to be actively engaged in the transformation of current work practices. Our study confirms this with a particular emphasis on the intricacy of reactions and interactions between different stakeholders during system implementation. The analysis of the case shows how the processes of configuring and reconfiguring a socio-technical network can be studied and understood well by focusing on the negotiations and translations between different key actors and stakeholders. This issue needs to be further elaborated in future research to provide a deeper understanding of the challenges involved in the implementation of network technologies.

Our research also contributes to improving the use of ICT within healthcare. Healthcare plays an increasingly important role in contemporary society. The gab between espoused beliefs in the benefits of using ICT and the difficulties faced in many particular situations suggests, however, that we need to know more about information and change management in this particular context. Our study suggests that managers in hospitals need to pay particular attention to the complex relationships between stakeholders when networked technologies are introduced. Healthcare managers are advised to proactively design implementation initiatives that allow for the necessary negotiations and translations to take place. Future studies could involve action research and experiments to explore more specifically how the notions of negotiation and translation could support tactics and strategies for successful implementation of ICT based networks within healthcare.

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Chapter 6

MIS AND THE DYNAMICS OF LEGITIMACY IN HEALTH CARE

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Abstract: Combining actor-network and neo-institutional theory, this paper reconstructs the MIS development and use in a Norwegian local public health care organization. Rooted in research of governmental IT and the corresponding implementation at the municipality level, the paper focuses on how the MIS project must be recognized both as an expression of institutionally infused change and as an actor-shaped change effort. More specifically, through a historical reconstruction of 1987-2000, we spell out how the MIS project legitimizes – and is legitimized by – the different types of logic at play: administrative, professional and democratic.

Key words: Management information system, Health Care, Neo-institutional theory, Actor Network theory, legitimacy

1. INTRODUCTION

It has been thoroughly demonstrated, analytically as well as empirically, how management information system (MIS) development gets caught up in a host of organizational issues. It is, indeed, becoming somewhat of a cliché, spawning efforts to advance the argument further by analyzing more specific aspects such as: development of theoretical notions (structuration theory, actor-network theory, activity theory), alignment with strategy formation, collaborative aspects, or user participation (see Currie and Galliers, 1999). Orlikowski and Barley (2001 p.154) states "to include insight from

institutional theory, IT researchers might develop a more structural and systematic understanding for how technologies are embedded in complex interdependent social, economic and political networks, and consequently how they are shaped by such broader institutional influences". In line with this our longitudinal case study similarly analyzes one aspect of this socio-technical interplay; namely, the way the MIS develops, adopts and diffuses through processes of negotiation and in competition with institutionalized practices, interests and norms. This implies analyzing how the MIS is legitimized, or is being legitimized by, ongoing, largely independent, local and national reorganization efforts. Thus, the MIS development is delegated a role and becomes an actor in the process. Essentially, our analysis aims to point out the fragile, contingent and highly improvised manner in which the changing alliances among the actors are forged. We are particularly concerned with how this unfolds in a local public health care organization, as this provides a vivid illustration of how the rhetorical thrust of public reforms meshes with local practices and priorities. Moreover, we will illustrate how the MIS, as a type of innovation in its different phases of adoption and diffusion, is influenced by the dynamics of legitimacy; i.e., we analyze how the problem of legitimacy is managed and how this influences the direction of the development process.

We begin the remainder of this paper by outlining our theoretical framework, arguing that neo-institutional theory needs to be supplemented with perspectives that are more sensitive to the fine-grained dynamics around the institutional embedding of a MIS in a public sector reform in general, and in processes of legitimization in particular. Actor-network theory (Latour 1987) is, in our view, a good candidate for that. Next, the research design is presented, followed by background on reforms and discourses on the restructuring of local and national public health care in Norway. The next two sections comprise the empirical core of our paper, a historical reconstruction (1987 – 2000) of the MIS development in the municipality of Trondheim. The final two sections consist of our discussion, interpretation of the implications of the process, and concluding remarks.

2. THEORETICAL FRAMEWORK

According to actor-network theory, humans and non-humans are linked together into actor-networks (Hanseth and Monteiro p. 331). Actor-network theory also assumes that (a section of) society is inhabited by actors pursuing interests and that an actor's interest can be translated into technical or social arrangements, for instance, an IS routine. A basic question it attempts to

answer is how a diverse group of actors reach agreement at all; that is, how a social order establishes a certain degree of stability or exhibits structural properties. According to actor-network theory, stability is the result of the social process aligning an initially diverse collection of interests "into" one accepted "truth" or stability. Truth or stability is therefore the result of reaching a certain degree of alignment of interests. Accordingly, the focus of such investigation is on those processes through which socio-technical networks are (or fail to be) created, sustained and dismantled.

Hanseth and Monteiro (1996) argue that actor-network theory offers a more specific and concrete approach to research the development of MIS than Giddens theory of structuration. Walsham (1997) discusses the possibility of a combination of these two, stating that "a combination of [Giddens structuration theory] and the methodology and concepts of actor-network theory would offer more than either one". Yet, we argue for a need to complement Giddens structuration theory and actor-network theory with perspectives that deal with the institutional context more explicitly than provided by Walsham (1997). At the same time, we intend to be critical of some aspects of institutional theory. We follow Orlikowski and Barley (2001) who argue that information technology research can benefit from incorporating institutional analysis, while organizational studies can benefit by following the lead of information technology research in taking the material properties of technology into account.

Within a neo-institutional perspective, formal organizational means such as MIS are considered rationalized myths. Rationalized myths are impersonal (collectively defined), taken- for-granted notions about what kinds of means are "rational" relative to given (institutionalized) ends. They are embedded in institutional environments and tend to persist over time because they are deeply rooted in professions, programs and technology (Meyer and Rowan 1991; 41). In organizational fields that undergo change and reform efforts, there will be conflicting and competitive rationalities and complex and conflicting environments. Accordingly, the problem of legitimacy will be pervasive when a field undergoes change. Within neo-institutional theory, organizational structures are argued to have importance apart from (and regardless of) their impact on participant behaviour. The structures are viewed as signifying purposefulness and rationality internally, and viewed as demonstrating the organization's connection to and congruence with wider belief and rule systems externally (Scott 1994). Accordingly, technological artifacts can be treated not only as rational instruments, but as also having an institutionalized value.

Recent studies of legitimacy seem to be divided into two distinct groups – the strategic and the institutional – which often operate at cross-purposes (Suchman 1995 p.572). The first group adopts a management perspective and emphasizes the way in which organizations instrumentally manipulate and deploy evocative symbols in order to garner societal support. The second group adopts a more detached stance and emphasizes the way in which sector-wide structuration dynamics generate cultural pressure that transcend any single organization's purposive control. In our view, such a division is entirely arbitrarily. We assert that this dichotomy is a problem within neo-institutional theory. It is precisely the relationship between the actors' strategic actions, values, norms and interests that is of importance.

Suchman (ibid p. 574) proposes the following definition of legitimacy: "Legitimacy is a generalized perception or assumption that the action of an *entity* is desirable, proper, and appropriate within some socially constructed system of norms, values, beliefs, and definitions". We have two comments about this definition. First, the concept "entity" should be interpreted broadly. It might be an IT artefact, an organizational unit or a written document. This is due to the ANT notion about an actant. It is not only humans who act. A MIS is also an active element in the actor-network in which it is being aligned. Second, legitimacy is something that is (re)produced continuously through action. Each generalized logic enters and transforms through contingent action. No organizational field of action is a passive reflection of socially constructed values, norms, beliefs and definitions (Friedberg 1997).

Heterogeneous functions, tasks, professions, client groups, and organizational cultures are key features of public healthcare services at the local governmental level in Norway. The heterogeneity is reflected in different organizational principles that are in simultaneous action. This combination makes it possible to strike a fragile balance between differing interests and values, but at the same time it creates dilemmas and contradictions between democratic, administrative and professional rationalities. Institutional values, such as the right to participate in critical decision-making (a democratic logic), must compete with the necessity to manage and control the organization (an administrative logic) and the professionals' claim for autonomy within their domain (a professional logic). The key to holding this together is the clients. On a general level, they represent a shared legitimizing base for all actors in the field, but this does not mean that there is agreement about how to deliver care to the client. When the actors express their opinion more concretely, they reflect the values and interests that prevail in their own domain. Accordingly, human judgment is an important element. This judgment gives rise to difficult

discussions and negotiation about how to prioritize and what criteria to use. It is a complex mixture between professional, administrative and political judgments. In such a context, the introduction of a MIS has a problem of legitimacy. As an innovation it must go through a transformation from a *stranger* to a *friend.*

3. RESEARCH METHOD – COLLECTION OF DATA

Four sets of qualitative data form the empirical basis of this paper. These include participative observations, interviews, informal discussions and electronic- and paper-based documents. The participative observations are due to the fact that one of the authors worked as an organizational consultant and planner in the organization from 1989 to 1994. Twelve interviews were carried out from 1997-2000 with key actors. In addition, three group interviews were conducted. The objective of these interviews was to reconstruct the story by tracing important events that had an impact on the development of the MIS. In addition, informal conversations took place during the process of reconstructing the story. Finally, various documents were reviewed and included in the background research. The documents include project schemes, project plans, internal memos, and project evaluations, political plans for the health care system, and documents on national policy reforms.

4. THE FIELD STUDY

The location of this study is the city of Trondheim with 150,000 inhabitants. Within a Norwegian context, it is a large municipality. The local government as a whole has about 10,000 employees, of which 3,200 are employed within the Health Care Department. The main client groups are the elderly, the developmentally disabled, and people with mental illnesses. During the period from 1987 to 2000, health policies were relentlessly reformed. The reforms ranged from sector-specific improvement within the municipally and local administrative reforms on the local governmental level to national sector-specific reforms. These reforms were firmly in line with theoretical concepts of modern public management.

The main strategic issue driving these changes in the health-care field was the increase in the percentage of elderly within the population. Coping with this increased demand required developing new ways of service

production to find a balance between scarce resources and the maintenance of a good quality of service. In that respect, an important controversy was the allocation of resources between home-based services and services provided in nursing home settings. The trend has been to prioritize home-based services at the expense of institutions. The legitimizing basis for this is that such a strategy contributes to better quality of service for each client and is the most effective use of resources on the organizational level. But the challenge, seen from the point of view of the administration, is how to find the right balance between these two services. This strategic issue is a mix of politics and technological issues. The MIS should be an instrument that provides the administration with a knowledge base that documents the positive effects of such a strategy. It should make political decisions concerning the allocation of resources and the development of the service-structure more in accordance with empirical facts.

The main actors in service production units include administrative nurses, surgical nurses, home-help workers, nursing assistants, health managers, doctors, physiotherapists, ergonomics professionals, and psychiatric nurses. Both nursing homes and service production units in home care are geographically dispersed throughout the city. Thus, the organization of care services in municipalities holds many similarities to the imaginary organization (Hedberg 1994) with few face-to-face contacts among the process-dependent actors.

At the administrative level were the following actors: 1) The Manager of Nursing Care (this actor was the driving innovative force and the entrepreneur behind the MIS); 2) The health care manager (a new leadership position due to the reorganization in 1992, yet the same actor as the person who was the Manager of Nursing Care); 3) Project leader (a nurse manager that was assigned to the project of developing the MIS); 4) Administrative staff (Economic, organizational, personnel) and 5) IT consultants. In addition, middle managers, system developers (IBM, Telenor) and IT-engineers from SINTEF (an applied research center) complete the complement of players.

5. THE EXPLORATIVE PHASE (1987-1992)

The MIS was introduced during a period of comprehensive effort to modernize care services in the municipality of Trondheim. One actor, the Manager of Nursing Care, was the main change agent. Being a former researcher within geriatrics, he entered the scene having relatively clear and

ambitious notions about "how to do it". He initiated several change efforts partly rooted in sector-specific ideas and partly in theories of modern public management. These ranged from new organizational structures focusing on a goal-oriented delivery of services, to the introduction of new management practices and the implementation of nationally initiated health care reforms. In a certain sense, he was a politician and entrepreneur, trying to influence both the actors at the grass-roots level and those elected by vote. In doing this, he was both a "stranger" and a "friend". He was firmly in line with current trends within the field, both within health care and modern public management. But this mixture also made him a stranger with regard to the institutional values at work on the grass-roots level. He might be characterized as a translator of general ideas embedded in the on-going reform efforts, trying to make them materialize in practice. To accomplish this goal, he was dependent on the other actors in the field. They represented obligatory passage points through which the change initiatives needed to pass (Latour 1987). On the grass-roots level he managed to restructure the care services in such a way that he became the central point in the evolving actor-network. However, there were problems. The nurses felt that their dominant position as leaders of the care services was threatened. Other professionals, such as the physiotherapists, expressed "fear" of losing their professional autonomy. To strengthen his role, he initiated rather intensive interactions between himself, his staff, and the nurse managers in the districts.

The MIS materialized within a management project based on ideas from Management by Objectives (1987-1989). The project included active and wide participation by the actors at the grass-roots level and focused on two complementary issues. The first issue was a discussion of the substantial value embedded in Nursing-Care services. This was a comprehensive effort to involve more and less every employee. There were structured goals for both clients and employees. Employees were considered to be inherently valuable, not only valuable as instruments in the hands of the organization. Such an institutionalized value then is at stake in the process of developing a new management practice. Some kind of negotiation was necessary to give the project a legitimizing base. What we observed here was a kind of change of direction in which the theory of MBO is translated to fit the values and interests at work in the field. Theoretically, MBO focuses rather one-sidedly on the goal of the "organization". In this case, the goal-structure turned into two autonomous values in which each of them had an independent and legitimate status. The dynamic of legitimacy was evidently at work.

The second issue was the need for more quantifiable and valid information about what was actually going on in the organization. The view

put forward by the Manager of Nursing Care was that there was an almost complete lack of valid data about the production of services. When requests for resources from different part of the organization were discussed, he felt it was difficult to understand the actual need for resources in concrete terms. There was also a more generalized argument. Managing according to the principles of MBO was considered to be impossible without valid information about the use of resources, as this was a prerequisite for evaluating goal achievement. This was the main legitimizing base for the MIS. Accordingly, the construction of a MIS became a concrete and autonomous element within the project. It was a statistical program that could classify the clients' situation according to certain variables such as level of functionality, living conditions, services received, and so on.

Within neo-institutional theory, Meyer and Scott (1983) introduced the distinction between technical and institutional environments. *Technical environments* are those in which organizations produce a product or a service that is exchanged in a market such that they are rewarded for effective and efficient performance. These are environments that foster the development of rationalized structures that efficiently coordinate technical work. In the purest sense, such environments are identical to the competitive markets. By contrast, *institutional environments* are characterized by the elaboration of rules and requirements to which individual organizations must conform in order to receive legitimacy and support. In institutional environments, organizations are rewarded for using correct structures and processes, not for the quantity and quality of their outputs. The health care sector is obviously operating within an institutional environment. However, the legitimizing base for the MIS implicitly stemmed from a desire to construct a system that was able to compute the cost structure of service production and to use it as input into a calculation of demand. This was perfectly in line with modern public management practices, a reform trend with a strong base in micro-economics.

The rhetoric surrounding the project was rooted in the usefulness of a "planning rationality". The project leader, an external consultant, argued that at the grass-roots level the actors were much too embedded in an individualistic "care-rationality" with too narrow of a focus on means; e.g., what kind of services were given to each client and not concerned about goal achievement in a broader sense. Therefore, the argument went, the individualistic "care rationality" must be complemented with a "planning rationality" (Forseth 1989). We see here how different values and interests operate in the field and how the Manager of Nursing Care used the external consultant as a spokesperson to try to legitimate a planning rationality at the grass-roots level.

The information system was designed as a classification card. It was called the "Main Card". An engineer at an applied research institute built the software program. By using the Main Card, the employee could classify the clients' level of functionality, what kind of service he/she should receive, possible improvements, the gap between the services ordered and the services actually delivered, and so on. A software program and a database were created which could statistically handle the data at an aggregated level. The aggregated data would be used as an input in decision-making processes for the allocation of resources. In the future it could also make it possible to assess goal attainment by measuring results.

Although the information system was both theoretically and technically well grounded in the methods of social science, the implementation failed. It became rather obvious that the actors at the grass-roots level, both leaders and employees, did not show much interest in using the system. This happened despite the attempt to give the MIS a legitimizing base through extensive participation in the MBO-project. It became a "stranger". During the years to come, several ad hoc initiatives by the Manager of Nursing Care were undertaken to make the MIS work. There was some progress but still with limited results. The Manager of Nursing Care stated, "The system survived, thanks to some key actors who believed in it". But it turned out to be a very poor management instrument compared to initial expectations. Even so, it did not die; it became a type of on-going failure. In spite of this, the Main Card became an important input in a national project concerned with the development of a computer-based statistical program. This program was renamed GERIX and was to be general standard for all the health care units at the local governmental level in Norway.

In 1988, a public reform was implemented in Norway which changed the jurisdiction of nursing home care from the county level to the local governmental level. Fourteen institutions of various sizes became a part of the Office of Nursing Care, which meant it grew considerably in size. To handle this reform, a decentralized strategy was chosen. The aim was close cooperation between nursing homes and home-based services in each district. Short-term stays in the nursing homes became a strategy. This approach was to enable clients to live longer in their homes and making the passage less dramatic if they needed to move to a nursing home permanently. This intensified interaction between these two types of services increased the need for valid aggregated information about service production. Politically, the strategy of giving priority to home-based services was controversial. Nursing homes offered security to clients; this was indisputable. However, capacity limits in nursing homes received a lot of political and mass media attention. The discussion was to a great extent

based on problems of individual clients. They could not live in their homes, but due to capacity limits in the nursing homes, they could not move there either. Such crisis incidents, which got a lot of attention in the media, increasingly put stress on top management to empirically document resource allocation. But reliable data was not readily at hand. It had to be produced in an ad hoc manner.

In spite of the slow progress in using the Main Card, the Manager of Nursing Care decided to implement the MIS in the nursing homes. A Nurse Manager was given the job to provide the necessary education to the personnel. She soon realized that the actors in these institutions did not give priority to learning the MIS. After she had worked with the project for some time, she realized that if the personnel were to use the program, they had to feel that it was useful to them for accomplishing their own work. In the summer 1990, an evaluation group was set up with the mandate to consider how the MIS could be improved. After considering different alternatives, the conclusion was to develop a new program based on the existing one and complement it with another one that had been developed in another city in Norway. This program, Stella, was constructed as a tool for managing day-to-day work at the grass-roots level. It included software programs for personnel planning and coordination of work, writing reports, and so on. A project group was established, and a contract was signed with the IT-company that had developed Stella. The "NIT PRO" project was born. It formally began in February, 1991.

6. THE TIGHT SPOT PHASE (1992-1997)

Toward the end of the eighties and particularly during the early nineties, the local government began to experience financial trouble. Initiatives were taken to remedy the situation resulting in a comprehensive reorganization, both politically and administratively. The Health Care Department was established. Roughly, the structure became as follows: Leading the department was the Health Care Manager. His staff dealt with planning, economic, and personnel issues. The level below consisted of six districts. These districts were constructed as relatively autonomous and integrated units (divisions) equipped with the necessary administrative resources to manage delivery of services in their respective geographical areas. The idea behind this structure was firmly embedded within the language of management by objectives. This local reform focused on formal organizational means to reach financial control. More or less, this new model implied the need for restructuring administrative processes. More

formalized procedures for planning and evaluating results needed to be developed. Accordingly, the reform changed the legitimizing base within which the MIS developed. In the wake of the reorganization, investments in new information technology were made. A network technology was introduced. A contract was made with an IT-firm (Teleport) to provide the organization with hardware and specified sets of software. This altered the opportunity for developing the NIT PRO project.

The Manager of Nursing Care became the Manager of the Health Care Department and thus his environment changed. This environment offered additional opportunities. He hired new staff members with competencies both within the field of statistics and IT. This time the MIS became an element in legitimizing ideas about strategic planning, evaluating results, and the need for developing new competence. At the same time, this represented a further legitimizing force for the development of NIT PRO.

To develop the NIT PRO, two persons were employed full time. One of them was the same nurse that previously had tried to implement the MIS in nursing homes. She was appointed project leader. The other person was equipped with technical competence. Together they were to develop the program in cooperation with the IT-firm. In addition, they were to plan and implement a pilot project to test the system in one of the districts. This included an educational program for those actors who were to participate and a hardware installation plan. At the outset, a cost/benefit analysis was drawn up. The following objectives were formulated: improvement of quality, better services to clients, improved and faster management of data, more goal-oriented use of the nursing expertise, and a rationalization of administrative work. The document was framed optimistically. It stipulated a potential cost reduction of 56 full-time positions per year. This optimistic prediction did not materialize.

As it played out, the project leader held a key role in the development process. She became a type of intermediary; negotiating the interests between actors at the administrative level and professionals/employees at the grassroots level. The same can be said about the cost-benefit report. By focusing both on efficiency and quality, a symbolic ”negotiation” was made. Moreover this cost/benefit report was to be considered a strategic document and used as a legitimizing base for the MIS.

The pilot project turned out to be problematic. When interviewed, the project leader said that the leaders did not have sufficient knowledge about the program’s objectives. Another problem that quickly materialized was the lack of existing organizational routines for updating information about the clients’ situation. Accordingly, this problem had to be dealt with at the same

time as the system was tested. In evaluating the project, the participants complained about the domination of technical issues at the expense of professional issues. A rather straightforward conclusion was made that the project required many more resources than expected and that the time schedule was unrealistic.

The project leader quit her job after she had tried to implement the system with the same "methodology" in one of the other units in the same district. This was the end of December, 1993. The reason she gave was that she felt that she encountered the same problems as in the first unit, despite the improvement of the system. Her conclusion was, as she stated it: "A project like this has to be developed within the existing line of authority". Therefore, what started out as an implementation based on an adaptive strategy did not succeed to any degree (Berman 1978)! This resulted in a "new way" to approach the development process based on a programmed strategy of implementation.

Although the pilot project can be characterized as a failure, the NIT PRO project was not. The outcome of the process was a new program with a form and substance that, to a certain extent, was in accordance with the interests of the managers in the service production units. It consists of several modules covering different functions. First, at the core of the system is information about clients. This module is a further development of the Main Card. The Main Card rose to the national level and returned with the name GERIX. It had turned into a national classification system, strengthening its legitimizing base. In NIT PRO it is used as a knowledge base. The system generates a weekly plan concerning the services given to each client. In addition, the information forms the basis for the documentation of performed services, invoicing of payments and the creation of statistics. Second, there is a module called Personnel Planning. In this module, information about employees is recorded and connected to the work plan, which is built into the system. This makes it possible to generate work lists by connecting information about the work plan for the employee and the service plan for the clients. Third, there is a module labelled Professional Planning. As the name indicates, it is constructed to help professionals diagnose, design and evaluate services for the clients. This module is partially based on management by objectives. Goal setting related to management by objectives is built into the system and is used in professional planning. The program for analyzing statistical data was also improved. Technically speaking, it is reasonable to say that the MIS reached a closure at the end of 1993.

In the wake of the collapse of the pilot project and the technical closure of the MIS, a top-down strategy was chosen. This change in strategy led to conflict, which paradoxically, strengthened the legitimacy of the system. Top administration used the dispute as an opportunity to get support for the system from political figures. This was accomplished by going back to the initial idea; i.e., stressing the importance of statistical data to be used in decision-making processes. The politician strongly supported this and the problematic situation was resolved. The politician urged administrative management to involve the employees. Accordingly, it became legitimate to invest in a comprehensive educational program so the employees could learn to use the system. However through technical training the employees were to learn to use the constructed system, a system that was biased toward administrative logic, interests and values.

7. THE CONSOLIDATION PHASE

After technical closure, a new structure for coping with the implementation and maintenance of the MIS was put in place. It consisted of appointed coordinators (later called instructors) in each district. A centralized coordinating group at the top administrative level was also established. An IT-based feedback system was established to link these two levels. This made it possible to both inform the coordinating group about problems in the system and make adjustments. An operative unit was established consisting of two persons. This unit became a permanent part of the health care staff and played an important role in adjusting and improving the MIS. It was also central in organizing the educational program. The MIS that started out as a statistical program to be used for administrative purposes now became a legitimate generator of a relatively large amount of resources. The period for step-by-step implementation of the MIS in the districts lasted from the beginning of 1994 to the end of 1996. More than 500 one-day educational courses were organized. From 1997 to the year 2000, 226 courses were held, with the number of participants reaching approximately 2000.

During the period of 1997 to 2000, the MIS to a certain degree turned into an obligatory passage point in the delivery of services to the clients. About 200 workstations are connected to the server simultaneously. By producing statistics, it was also an element in a wider actor-network. It "settled down" in centers of calculation (Latour 1999) both on the local governmental level and through GERIX on the national level. However, there is only partial use of the system. The statistical data produced is used

in a highly improvised manner and on an ad hoc basis. In spite of this, it is reasonable to say the system was implemented on a large scale. Although still contested, it has become a necessity in the day-to-day activity of the service production unit.

Concluding the story, we state that NIT PRO represents a compromise. This compromise resulted from the power play that occurred during the development process. The actors at the grassroots level, when using the system for their own sake, now do the job of classification which is required for the production of statistics. The Main Card became GERIX, and its focus on the classification of the users and the production of statistical knowledge is now less prominent. It is integrated into the system of day-to-day coordination of service production and has a more invisible role. Actors at the grassroots level produce statistical data that are primarily to be used elsewhere. At the same time, they have an administrative system for their own use. The administrative elements of the MIS have been put to use, but the way they are used is far from the original intentions. The professional element is barely used. The reason is that the professional practice is to far the model of MBO inscribed into the software program. Moreover, that the surgery nurses do not use the system clearly demonstrates their freedom of action. It also demonstrates they have an autonomous legitimating base that is difficult to negotiate concretely with the administrative logic.

8. DISCUSSION: THE DYNAMICS OF LEGITIMACY

8.1 Ongoing Failure as an Acting Legitimate Force

In its first life cycle, the MIS was a failure, although it was not explicitly stated as such. It might be characterized as a failure in that the administrative management did not succeed in inscribing the system into the already existing actor-network. This was due to contradictory values and interests at work i.e. sources of legitimate power that is highly ambiguous. The formal authority of the administrative management has to compete with professional authority. From the premise that IT is the product of human action Orlikowski and Robey (1991 p. 153) states: ".....the content and form of an IT artifact tends to reflect the assumptions and objectives of its designers". It is rather obvious in this case that the system in its first phase reflected an administrative and a scientific logic expressed with force by a charismatic leader. Moreover, the institutional values and interests that the administrative management tried to inscribe were too biased towards their

own logic; concerned with efficiency and effectiveness and relying too much on the formal authority given to them by the overall institutional system. The institutional values that prevail at the grassroots level, and accordingly their interests, obey a logic that is radically different from the logic that prevails at the administrative level. The care-logic can be characterized as: When people need help we are obliged to give it to them. When resources are scarce we have to give priority to how to coordinate the personnel in order to make the best out of it for the clients. In such a context, the MIS becomes a stranger. It was an ongoing failure, functioning as a proactive element in management processes implemented to improve organizational practice.

How can we interpret that the actors at the grass-roots level did not follow up on the intentions of administrative management? Although they did not "obey orders" they could not deny entry to this stranger. They had to cope with the Main Card as a legitimate problem in the sense that the decision to implement it was based on legitimate power; i.e., the formal authority of the administration. However, at the same time they had to prioritize in accordance with their strong legitimizing force; that of giving care to clients. Within a professional logic this is given more value than the "duty" to help the administration to produce statistical data. Accordingly, the actors at the grass-roots level were put into a dilemma in which they had to cope with prioritizing between different claims, each of which could not be completely ignored. To a certain extent they resolved this dilemma by using the Main Card in planning improvement, thereby communicating their prioritization of it as an object of development.

The moment the Main Card was installed in the service production units it started to act; i.e., the actors could not ignore it. It claimed attention positively or negatively. Viewing it as a failure, then, is based on a comparison between the intentions of the administrative management and the unfolding of events. In that respect the "implementation" turned out to be a failure. When we state that it was an on-going failure, we point to the fact that it had started to act, although fragile and primitive technically, as a legitimate actant that had to be taken into consideration by all of the actors. In that respect the Main Card did not act primarily as an instrument within a rational logic, but rather as a symbolic force signalling a shortcoming that should be handled. To have constructed and installed a system, albeit a non-working system is a stronger inscription than to simply utter verbally that there is a need for statistical information.

8.2 The Ambiguity of Participation

The dynamic of legitimacy can be found in the pilot project as well. Participatory design has a strong legitimizing base in this field. From the point of view of the administrative management it appeared to be a sensible strategy, although it demanded resources. Why did it turn out to be a failure and later become a top-down process of implementation? We propose the following interpretation: There is a difference here in the way participation is tacitly defined by the actors. Conflicting logics, interests and values are at work. The project leader wanted help to test out the NIT PRO technology. She took the system's legitimacy for granted and expected (without testing such an assumption) that she needed someone on which to test it. The participants, on the other hand, expected that they could influence the form and content of the system so it fit their interests. These interests are perfectly legitimate, but difficult to state explicitly. They did not enter into a discussion in which this was made explicit. Put in this way, we can see why the project broke down. Due to the contradictory values and interests between the structure of the MIS and the values and interest in the existing organizational practice we have a conflict of interest where a nearly-completed technological artefact was to be implemented without adjustments to make it fit with organizational practices. In a certain sense, we could say that the project manager's ability to make a compromise reached its limit between administrative interests and guiding values, and professional interests within service production units.

In the aftermath of the collapse, administrative management re-examined the development process. Administrative management chose a top-down strategy of implementation. However, in the wake of this change of implementation strategy, criticism of the system arose. The criticism was articulated both from the labour union and certain politicians. Because of this criticism, it was decided that the Control committee in the municipality should investigate the NIT PRO project. The conclusion was that the employees should participate more intensively in the project. What a paradox! Up to this time there had been very little public criticism of the system. Even the labour union had been rather silent. The criticism, so to speak, lived an informal life. We can interpret the forthcoming criticism as a result of the tensions created by the top-down strategy of implementation. Such a strategy rests heavily on the power embedded in the formal authority of the administrative management, combined with an instrumental means-end notion of implementation. We claim that participation in such a strategy is implicitly concerned with how the employees will contribute to the implementation of the system (the system considered as a neutral tool to be

implemented). The participants' possibility of influencing the process or the system itself is not an element in such a strategy. Due to the structure of domination, the employees are forced to participate in implementing a system that already has a certain structure—a structure that to a great extent is biased toward an administrative logic.

What happened next is a good illustration of the dynamic of legitimization. The above criticism became an opportunity for administrative management to further legitimize the MIS. They needed to respond to the criticism. The politicians expected an explanation. The request for such a response turned into an opportunity to get support for the goals of the project. A paper was presented which offered a historical perspective of the introduction of IT in health care. This paper underscored that the goal was to create statistical information to be used in the decision-making process. The political response was very supportive toward this goal, but they ordered the administration to be more sensitive towards employee participation. Accordingly, administration needed to show a response and the result was that the MIS started to garner resources. It became legitimate to establish an IT staff unit responsible for the maintenance of the system, technical training and a new structure concerning the maintenance of the NIT PRO in each of the service production units.

The dynamic between changes in the strategy of implementation from an adaptive and participatory design-oriented strategy to a programmed strategy (Berman 1980) (in which participation has a different meaning), and the crisis that arose resulted in a strengthening of the MIS as a technological artifact. What we see here is a transformation from a crisis into a strengthening of the MIS. The strengthening of its legitimizing base became so strong that it became legitimate for the leaders in service production units to decide that all paper-based information should be thrown away on a particular date in order to force employees to use the NIT PRO.

9. CONCLUDING REMARK

By focusing on legitimacy we have entered the symbolic dimensions of IT. This is an issue that is underdeveloped in the IT field. In line with Orlikowski and Barley (2001) we argue that neo-institutional theory with its focus on values, norms and moods of rationality can make a contribution. In this case study, there is an intricate balance between freedom of action for the actors at different levels and the symbolic games that bind them together to create the necessary minimum integration. Actors within different

domains of the organizational field operate within their own specific logic and values. A better understanding of the development of the MIS calls for an approach that goes beyond the relatively passive notion of "mediating change". The heterogeneity of a field with contradictory values and interests and the resulting ambiguity surrounding the problems of efficiency and effectiveness must be an explicit element in the analysis. With that in mind, we underscore the highly symbolic character of the process of developing the MIS.

On the other hand, neo-institutional theory has its own challenges. We criticize the implicit tendency to classify something as either symbolic or material. Such a dichotomy is destructive if we want to explain the interaction between the technological and sociological. In this paper we have attempted to use ANT as the methodological vehicle to understand processes of legitimacy and their effects. The MIS project was delegated a proactive role. In the organizational upheaval, both at the local and national levels of health care, several actors attempted to enrol the MIS as an ally. We argue that the prevailing interests within the local health organization, employing strong images of new public administration in conjunction with the MIS, encapsulated the existing power structure thus reducing the opportunities for more radical IS-based management practices. Although there is a need for further exploration of how politics and knowledge interact during the development and use of a MIS, we suggest that reforms in the public sector need to take on the active, ultimately political, role played by MIS.

Given that legitimacy is an important aspect of the development and diffusion of MIS, more research is needed to gain a more thorough understanding of the way it operates. Although this case analysis demonstrates that conflict of interest and the use of power are important ingredients in MIS development and diffusion, we also observe a certain harmony. This is due to fact that when we add legitimacy to power; i.e., legitimate power, we are entering a world in which important issues to a great extent are not discussed because it is not legitimate to do so. Curiously, this does not mean that what is not discussed is illegitimate. Rather it is due to the fact that if it is discussed it threatens the structure of dominance. This is both the strength and weakness of legitimacy. There is someone who wins and someone who loses, but because everyone has a legitimate position no one completely loses or wins.

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Chapter 7

ROLE MODEL FOR THE ORGANISATIONAL IT DIFFUSION PROCESS

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Abstract: Organisational IT diffusion is a complicated process. Certain roles have to be filled and enacted to ensure success. However, in diffusion and adoption projects is it often forgotten to fill the roles appropriately. Based on an empirical study in a Scandinavian company this paper presents a model to be used for filling and handling the primary roles in an organisational IT diffusion process. The model was developed using action research with three cycles of diagnosis-action and learning. The main sources of the model were change management theory, diffusion of innovation theory and soft systems methodology. The role model has been used in a large number of projects with a positive outcome; the model can be used to identify some important potential IT diffusion problems at an early stage, thereby making it possible to avoid the problems.

Key words: IT diffusion, organisational roles, action research

1. INTRODUCTION

In a study from 1998 IT managers were gathered in Asia, Europe and USA to identify software project risks. The following list came out as the five most prominent risks (Keil et al. 1998):

1. Lack of top management commitment to the project
2. Failure to gain user commitment

3. Misunderstanding the requirements
4. Lack of adequate user involvement
5. Failure to manage end user expectations

The interesting thing about this list is that development oriented things such as "short-changing quality" or "developer gold plating" or "overly optimistic schedules" which were often mentioned in the past (cf. Boehm 1989, Jones 1994, McConnell 1996) as major concerns are absent from the list. Instead we find *key roles* in the IT diffusion process – such as users and top management – that seems to be either unfilled or not enacted appropriately.

The notion of key roles is not new in research on organisational diffusion. Research in organisational diffusion has highlighted the existence of *key roles* for individuals. For example: the gatekeeper who brings information into the organization, the champion advocating and supporting the diffusion, and the opinion leader who is connected to many people and thereby influences adoption decisions.

However, a majority of the research in organisational diffusion have been confined to describing roles found in studies of individuals, groups or organisations. Whereas studies prescribing what key roles to fill in a concrete organisational diffusion project have been scarce. Therefore this research project set out to develop recommendations for key roles through an action research undertaking.

The paper will be developed as follows. In section 2 we will give a thorough account of the action research that has led to the role model. We focus on the diagnosis, the action, and the learning. In section 3 we give an account of the role model with a focus on how to use the model. It is our hope that this paper can serve as a knowledge transfer mechanism to other organisations facing similar diffusion problems. Therefore the account is relatively detailed. In section 4 we then give examples of the impact that the model has had. And finally in section 5 we summarise and conclude the paper.

2. ACTION RESEARCH PROCESS IN SCANDI

The research described in this paper was carried out in a large Scandinavian organisation. The organisation as a whole has more than 20.000 employees but only 10% of them are developing IT. For easy reference we will call the organisation SCANDI in the remainder of the paper.

In 1997 SCANDI became aware that many new IT products and processes were *not* diffused and adopted as intended. A task force including

the author of this paper and two practitioners from SCANDI were formed a group to cope with this diffusion problem.

We decided to use action research. Action research is an interventionist approach to the acquisition of scientific knowledge (Baskerville & Wood-Harper 1996), and a key aspect of action research is the "collaborative nature of the undertaking. The research scientists work closely with practitioners located within the client system. These individuals provide the subject system knowledge and insight necessary to understand the *anomalies* being studied."

In our case the *anomaly* being studied was the lack of diffusion in SCANDI. Several things were done to cope with the problem, but in this paper we will concentrate on the modelling of key roles in organisational diffusion – even though in reality this was only part of the solution framework developed.

Besides collaboration another distinguishing feature of action research is iteration. Baskerville and Wood-Harper says: "The distinguishing characteristic of iterative action research is the overall repeating sequence of major activities such as diagnosis, action and learning". In the concrete we executed three major iterations and several minor ones. Below we give an account of the three.

2.1 First Round of Diagnosis, Action and Learning

Our first diagnosis took place in 1998 when a number of experienced project managers from SCANDI meet at a workshop. Each participant in the workshop was asked to bring with them documentation on a successful and a failed project. A main part of the workshop was then used to diagnose why the projects were a success or a failure. Table 1 shows the findings from the workshop.

While studying the organisation's successes and failures we realised that attempts to ensure diffusion by adding some additional activities at the end of the project is doomed to fail. It is necessary to start such attempts so early in the project that they will have an effect on the product itself. Therefore, we decided that we would try to come up with techniques to be used in a project right after the requirements had been defined. At that specific point of time, the project group knows roughly how the product is going to work although no specific solutions have yet been prepared.

When analysing the 10 projects after the workshop we also found that no single role – such as top management – could ensure or explain diffusion success or failure (cf. italicised text in figure 1).

Table 1. Major Reasons for Success or Failure in 10 SCANDI Projects. In Each of the 10 Projects the Key Roles Involved in the IT Diffusion are Italicised.

Successful projects The diffusion and implementation of this project went well because:	**Failed projects** The diffusion and implementation of this project was a failure because:
Project Alfa The implementation were planned long before it should happen Training was developed and given in time to *target users* There was a support strategy ready for use after the launch of product - and *people* were allocated for support	**Project Foxtrot** It was difficult for the *users* to understand the system A *colleague (to users)* came around and informed - months before the system was launched Written documentation on the system was unfit for use - and had to be explained to *users* in numerous emails.
Project Bravo The system was intuitive for *users* to use There were clear advantages for *the users* - each and every one saved time The system was "transparent" - there was a built-in map that showed a *user* exactly where and how far they were when a *customer* called with a question	**Project Golf** There was *not one person* that took responsibility for the whole diffusion process and co-ordinated across departments No *person* in the project had sufficient in-depth knowledge to deal with external partner in the project
Project Charlie *User* expectations were harmonised early in the project i.e. through several visits by *developers* at the user site System and workflow descriptions matched each other	**Project Hotel** The system should launch at a certain date. Therefore training was rushed and given when *many users* were on holiday It was a totally new graphical user interface including new terminology which took time for the *users* to get acquainted with *The users* expected a "Rolls Royce" but got a "Skoda" *User* support wasn't sufficient nor obtainable
Project Delta *Managers* were prepared in advance to engage in dialogue with their *associates* At the right time information was published to *target users*: Why, when and how? And after the information it was clear to *the user*: What do I get out of this system?	**Project India** *The users* experienced many deficiencies due to unclear expectations and misapprehensions on requirements *Developers* had made way too optimistic an estimate - which led to time pressure and then to a system filled with defects
Project Echo *Pilot customers and customer* service were involved early There was *top management* backing all the way (also because it was a so-called focus project) Quality meetings were conducted en route	**Project Juliet** Technical problems: It was not possible to print colourful screen content because there were no colour printers *The Headquarter* didn't inform *the users* and didn't support the system with allocation of necessary resources

Our first action was to take Soft Systems Methodology (Checkland 1976, 1981, Checkland & Scholes 1990, Checkland & Holwell 1998) and ask ourselves; wouldn't this methodology be useful for our problem? We then desk-tested SSM and found that especially the CATWOE mnemonic could be useful. CATWOE stands for Customer, Actor, Transaction, Weltanschauung, Owner and Environment. This mnemonic is used formulate a careful statement about purposeful activity for a "relevant system" in a given (soft) situation.

However, when desk-testing – that is analysing the 10 projects (see table 1) at a desk asking for example; could this have been prevented – SSM and CATWOE we found that the diffusion situation was ignored. We then made a literature search and found a number of other diffusion roles such as change agent, opinion leader, sponsor, champion, gate keeper that were not mentioned in CATWOE.

Our first action was then to combine SSM with the roles we had found in diffusion theory into what we called a role model – shown in figure 2.

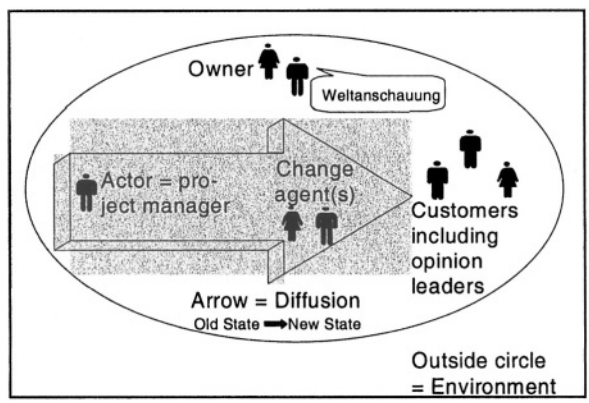

Figure 1. **The First Role Model Derived from SSM, CATWOE and Diffusion Theory**

This model was tested the model in three IT projects. In the concrete we asked the project manager and project participants to name the people filling the roles in their project. Very often it was not possible for the project to put names on one or sometimes two of the roles.

Some of the learning from this phase (phase 1) was:

- In practice it was difficult to distinguish between opinion leaders and change agents.
- There were often two project managers, one in the development organisation responsible for the IT product, and one in the user organisation responsible for diffusion

- Many projects mentioned the CEO as their owner well knowing that due to pressure of work they couldn't expect any real active participation or intervention from the CEO. Using diffusion and adoption theory as inspiration we coined this positive but inactive role "sponsor", and decided to distinguish between owner and sponsor
- There often were many other stakeholders than the few key roles shown in figure 1. In fact several projects recommended us to combine figure 1 with a traditional stakeholder analysis.

2.2 Second Round of Diagnosis, Action and Learning

We then decided that our next action was to implement stakeholder analysis together with the role model in figure 1.

A *stakeholder* is a person, groups or organisation with interests in the IT project. To get an overview of your stakeholders a stakeholder analysis is carried out. This often includes identification of stakeholders, evaluation of their importance, and decision on how to handle the most important ones (Boddy & Buchanan 1992, Turner et al. 1996, Yeates & Cadle 2001).

In the concrete we came up with a process where we asked the participants in a project to identify all the stakeholders in the project using a brainstorming techniques. The stakeholders found were written on yellow stickers. The stickers were then sorted in a stakeholder grid (inspired by Turner et al. 1996 and Andersen et al. 2001 as shown in figure 2). The stakeholder grid was used to identify candidates for diffusion roles, thus the italicised text in figure 2 show where possible candidates for key roles could be found.

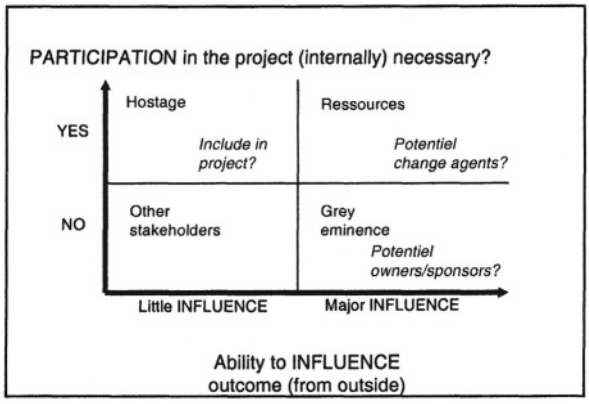

Figure 2. Stakeholder Grid for Sorting Identified Stakeholders

We tested this combination of stakeholder analysis and diffusion roles in a number of projects. But the outcome was negative. We identified too many stakeholders. We used too much time to discuss each and every stakeholder. And we couldn't see the wood (=diffusion) for trees (= stakeholders).

Thus our learning from this second phase – which took place in the spring of 2000 – was that a model of stakeholders in diffusion of an IT project needed to be simple, nimble, fast and easy to use.

2.3 Third and Final Round

We then returned to some of the learning from the first phase. We decided to stop trying to distinguish between opinion leaders and change agents. The person that actually brings about a change in the target users behaviour we decided to call "champion". We also decided to stop distinguishing between two project leaders – one for the product development and one for the organisational diffusion – and only focus on the management of the organisational diffusion. Finally we decided to stop trying to distinguish between the owner and the sponsor because we found that in 3 out of 4 projects the two roles were filled by the same person.

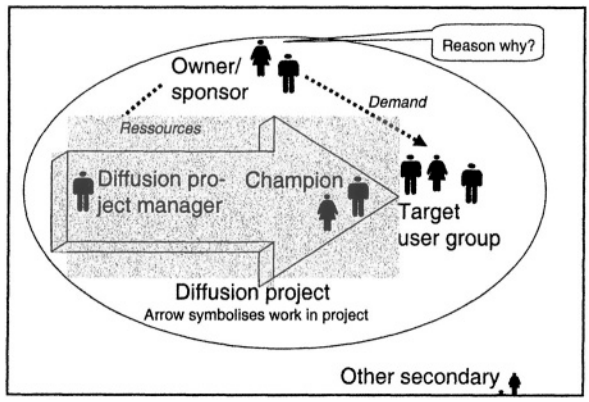

Figure 3. The Final Model of Primary Stakeholders in IT Diffusion and Adoption

So our third round diagnosis ended up with the model shown in figure 3. This model is now (2003) in regular use in SCANDI. Recently (late summer 2002) approximately 20 new facilitators at SCANDI were taught how to use the model. How the model is used and what impact it can have is described in the following sections of this paper.

2.4 Validity of this Action Research Study

When using action research for the kind of study described here there is a number of things to be aware of. First of all you need to strive for rigorous and disciplined action research (Baskerville & Wood-Harper 1996). To ensure that all our data collection was done during and immediately after the workshops. We videotaped every testing of the model and used the tapes to make sure that we had captured every important piece of information. And we wrote a summary for each instance of testing that were send to the participants so they could acknowledge that we had captured all decisions and discussions correctly.

Furthermore when we adjusted our role model – as described above – we always tried things for a minimum of three times (that is in three different projects) and looked for at least two consistent observations of non-satisfactory results before we adjusted the model. The interpretation of results was done in a group of two or three persons with at least the author and one practitioner from SCANDI taking part. The decision to change or adjust the role model was agreed by the whole group every time. Thus by doing the adjustments in such a rigorous way we hoped to avoid the danger of making to many "in-flight changes" that complicated or compromised our model instead of improving it.

For evaluation we used a questionnaire that all testing event participants filled out. This gave us valuable information that we used for diagnosis and re-design.

3. THE ROLE MODEL DESCRIBED

The role model for key roles in organisational IT diffusion (figure 3) is about change from one state (today) to another (hopefully better) state. In the role model the change is symbolised with a large arrow from left to right. It is not incidental that the arrow points towards the target user group. The reason is that most changes is not about producing IT but about getting some people to change their behaviour with IT.

For example it is not enough to develop and install a tool that can measure customer satisfaction. Someone has to use the tool before any change happens. It is especially here that a change project reaches beyond a traditional IT development project. A software development project typically includes analysis, design, coding and testing. While a change project really begins when the newly developed IT system is ready for someone to use it.

The four key – or primary – roles in the model are:

- Owner – or Sponsor – the person or group endorsing the project, providing resources, and demanding the results.
- Diffusion project manager – the person heading the group that implements the change
- Champion – the person that in practice affects the target user and ensures the accomplishment of the change.
- The target user group – the users, specialists or managers that are to adopt something new, typically a new IT system.

Besides the four central roles there are two other core elements in the role model:

- The reason why? This is Raison d'etre for the change. Or the Weltanschauung (Checkland 1976, 1981) as we first called it. The question here is: Why is the change feasible and desirable? We have shown the reason why as a speech bubble issued from the Owner to indicate that it is important for the diffusion or the change that the Owner can argue why the arrow "points" towards the wanted change for the target group.
- Other secondary stakeholders. In many (all?) projects there are more stakeholders than the four primary ones that we are focusing on.

3.1 How the Role Model can be Used?

The purpose of the role model is to give full consideration to who occupies or is supposed to occupy the four key roles in an organisational diffusion process.

Start by identifying the desired end state for the change. Try to define the end state as something *someone* can do different than today. "Someone" doing something is then the target user group.

For each of the four primary roles – one by one – try to put a name on. And "put a name on" is meant literally. In figure 4 there should be names on each of the small figures. The cause for this is that if you just say "a department manager" then none has responsibility, but if you say "Anne Andersen" (or another name of an existing person) then there is no doubt about who is to be hold responsible.

Finally – as soon as all the roles has had a name assigned – the reason why is defined for the project.

In figure 4 we have shown the template used in practice in SCANDI.

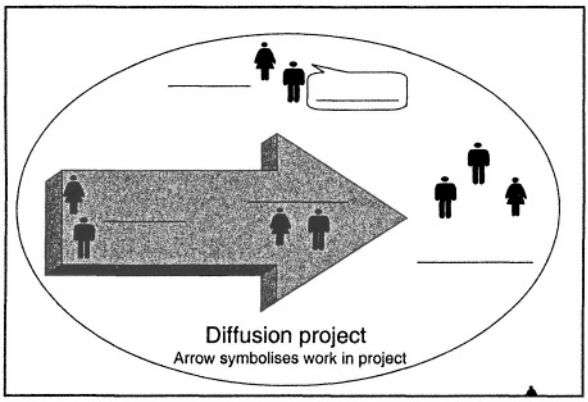

Figure 4. The Template Filled out by Projects in SCANDI

4. USING THE ROLE MODEL AND IDENTIFYING DIFFUSION RISKS

In the four sub-sections below we go in-depth with each of the four key roles. We also consider the risk of having a role not filled, and what can be done if a role is not filled.

4.1 The Owner

The owner is the person or group that endorse the project and demands the results. To endorse implies formal and real power to allocate the necessary resources, including the appointment of a project group or a t least a project manager.

It is also the task of the owner to stake out or scope the change project i.e. in the form of a goal or rationale for the project. To stake out the project is no easy task. If one goes too much into details it may stifle the project manager's initiative. If one on the other hand doesn't stake out the project then the project manager will paddle his own canoe – and who knows where that leads?

Projects don't exist in a vacuum. There will be many other projects going on at the same time. Here the owner has the task of smoothing out conflicts among projects. In general one can say that the owner shall remove the barriers that the project encounters – especially if they are outside the projects area of competence.

To demand or ensure results are no easy task either, but it is a core role for the owner. Dozen of projects have "grinded to a halt" after delivery of something new simply because the target user group found that no one demanded the results from using the new thing, and then they stopped using the new thing off course.

Often it requires involvement of the line organisation to establish a demand. Let us take an example from SCANDI. We are to create a new way of doing estimation of future projects. We develop a techniques and a process and teach all project managers in the organisation to use it. Now they will most likely start using the new estimation techniques. But if a project manager experience that his nearest superior(s) doesn't demand estimates made the new way, but in the old way being it a ballpark figure or a political game, then the project manager quickly will learn not to estimate the new way any more.

As it appears it is demanding to fill the role as owner. Therefore the owner is most often found among top management. Only there one has enough power and influence. This means that most people in top management will have more than one project that they are owner for. Some times this means that it is appropriate to intercalate a person between the owner and the diffusion project manager – a mentor who can coach the diffusion project on a day to day basis. I.e. a person from top management can be owner and a department manager can fill the role as mentor.

4.1.1 The Risk of Not Having the Role as Owner Filled

In SCANDI we found two typical reasons for not having the role as owner occupied. One was that the change project was pushed forward by a group of users. An urgent need among the users was so motivating that they succeeded in getting a project started. The other reason is that someone from below has taken the initiative. A department, a group or maybe even an individual is dying to implement an idea, and has succeeded in starting a project to implement the idea.

4.1.2 Situation 1: User Group has Taken the Initiative

In the first situation – a user group has taken the initiative – it is most likely that the user group and the development organisation are out of stroke. This may for example mean that the two parts of the organisation sees different objectives or disagrees about the means to be used. Here experience shows (cf. Mintzberg 1994) that it is far more important to agree on the process than on the objective. In organisations where one agree on the objective but not in the means no change happens, whereas in organisations

where disagreement is about the objective but there is agreement on the means lots of changes may be seen. In the concrete we learned at SCANDI that one can bring the user group together with potential owners to see whether the two parts can get in step in the project.

4.1.3 Situation 2: The Project Initiated Below

In another situation where the initiative came from below it is extremely important to get the top of the organisation to join in. The project may well be carried out without support from the top (when it is running – and nobody steals away the resources), but if no one from the top demands the results it is often doomed to collect dust on shelves. An example of this in SCANDI was a very enthusiastic individual that managed to get funding for building a project managers dashboard using a statistical tool to manipulate existing figures in the organisation. In the concrete potential owners have to be contacted; find out what is on the agenda and sell the idea as a solution to an issue that is being discussed.

4.2 The Diffusion Project Manager

This diffusion project manager is the person or persons that in practice prepares and carries out the diffusion. Or said in another way: This is who carries out work. The diffusion project manager is often the same as the development project manager.

4.2.1 The Risk of Not Having the Role as Diffusion Project Manager Filled?

Not much happens in a project where nobody is working. Thus the risk is minimal!

If an owner/sponsor wants something to change then a project has to be initiated and resources have to be allocated. If the search for a project manager is unsuccessful then it is probably because the conditions offered are too inferior. The risk for failure may be imminent and who wants his name attached to a failure? As owner one can command an individual to be project manager. However, this seldom leads to a motivated or hard-working project manager. Instead it is better to conduct negotiations with potential project management candidates aiming at agreeing on some satisfying conditions – being it calendar time, resources or the scope that has to give in.

4.3 The Champion

Champions are the persons or groups that in practice influence the behaviour of the target user group and ensures the accomplishment of the transformation wanted. We know that transformation happens one person at a time (cf. Weinberg 1997). We also know that some (groups of) persons transform their behaviour before anyone else. Rogers (1995) call these persons innovators or early adopters. If you can get these persons to transform behaviour then the likelihood increases of transforming the whole group of target users.

The idea in having a Champion is exactly to use this mechanism. That is to find some persons for which other persons notices their action and behaviour (opinion leader in the terminology of Rogers, 1995) or who are capable of convincing and changing other people behaviour (change agents in Rogers, 1995). By having the role as champion occupied the change of successful diffusion increases dramatically.

However, to ensure that the Champions are eager supporters is easier said than done. Nobody will support something they don't understand or believes in. Therefore it is important to identify potential Champions early in the project and involve them in the project. And if the involvement is real and they have real influence it can expected to lead to some very enthusiastic project participants that are looking forward to "selling" the idea to the target user group.

Often the Champions are found among line or functional managers (middle management) in the organisation. The reason for this is that in such a position one can easily follow up and ensure change of behaviour on a daily basis – making sure that the new thing becomes part of a routine way of working.

4.3.1 What if the Role as Champion is not Occupied?

If the role of Champion isn't occupied you may experience slow or no diffusion at all. However, it is never too late to identify and engage Champions, but the earlier it is done the higher the success rate. Therefore: Think early, who can be Champions? Involve them. Give them real influence. And make them ready for the role i.e. by having meetings where champions meet and exchange experiences.

4.4 The Target User Group

The users, specialists or managers that are to take something new into use are called the target user group. Who that is off course depends on which project and product we are focusing on.

Many diffusion projects at SCANDI failed because a project group thought they had enough knowledge about the target user group, or because they just assumed that the user group was like themselves.

Therefore one should ask "Do we really know the target user group?". If not you can use interviews or focus group meetings to get an insight into how the users think. Such knowledge will also make it easier to target information and communications in such a way that the target user group experience that there needs are addressed.

5. SUMMARY AND CONCLUSION

In this paper we have presented a model used to identify key roles to be filled and enacted in an organisational diffusion project. The model was developed in the period 1998-2003 in SCANDI. Action research was used to develop the model. First the model was developed partly from theory on diffusion, adoption, change and soft systems methodology, and partly from an analysis of successful and failed projects in SCANDI.

Second we developed an approach where we used a traditional stakeholder analysis to identify all stakeholders. In one case we identified more than 30 stakeholders. Unfortunately we could not use all that information for anything meaningful. Therefore we ended up with a more simple and nimble role model (figure 3).

We believe the role model covers the major roles in any organisational IT diffusion and implementation – at least the ones we have met in SCANDI. And we have often found that one or even two of the roles was not filled with "actors" from the organisation in the concrete project.

So the use of the role model often leads to the identification of a major potential problem, namely that an important role is not filled or enacted causing a risk for diffusion failure if not addressed.

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Chapter 8

SHOULD BUYERS TRY TO SHAPE IT-MARKETS THROUGH NON-MARKET (COLLECTIVE) ACTION?

Antecedents of a Transaction Cost Theory of Network Effects

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Abstract: This paper develops a transaction cost theoretic model of network effects and applies it to assessing the chances of user groups to influence the range of technological choices available on the market. The theoretical basis of the model is formulated by a number of empirically refutable propositions which overcome some conceptual and empirical difficulties encountered by the traditional interpretation of network effects as (positive) network externalities. The main difference between our model and modelling network effects as network externalities is that network effects are seen as caused by the costs of purchasing/marketing new technology, i.e. transaction costs, rather than by the benefits of using new technology. A preliminary application of the model suggests that a user group's ability to function as a conduit for information exchange and knowledge sharing can significantly improve the chances of replacing an established technology by a new, potentially superior one. This, however, would call for a rather different type of user group than exists today.

Key words: Standardization, Collective Action, New Technology, IT-Procurement

1. INTRODUCTION

As information technology (IT) increasingly permeates all kinds of business operations, firms' dependence on IT suppliers increases too. This would be of no concern if IT markets were perfectly elastic, not only in terms of quantity supplied but also in terms of responsiveness to new requirements as they arise. However, the fact that user groups frequently try

to actively influence IT vendors' product policies indicates that this cannot be taken for granted. It seems that users, at least partially, have to retreat to means of collective action in order to induce suppliers of new technology to incorporate users' demands in their products (Lundvall 1990, Saloner 1990).

From a theoretical point of view the idea of perfectly responsive technology supply markets has also been questioned. Beginning with the 1985 paper by Katz and Shapiro, a huge literature has emerged on the possibility of "market failure" in technology supply markets. This literature evolved around the concept of "positive network externalities" (PNE). PNE stand for a situation in which—the telephone network being the archetypal case example—the benefit one consumer derives from using a product increases with the number of other consumers of the same product (Arthur 1996). Moreover, the PNE concept has been extended to capture so-called indirect network externalities which are said to exist in systems markets (where different products form elements of a system which is useful only in its entirety) and to geographical networks such as distribution and service networks (cf. Church et al. 2003 for a recent discussion of this extension).

A large part of the literature is concerned with a phenomenon which is called "network tipping." Network tipping means that in markets characterized by positive network externalities, one product tends to capture the whole market. Since this need not be due to some intrinsic superiority if positive network externalities are present, there is a certain likelihood that inferior products, or rather products which do not accurately reflect users' requirements, dominate a market. Since this effect results from the uncoordinated behaviour of users who each make their decisions without regard of their decisions' effects upon other (potential) users thereby creating an externality, collective action might indeed prove the only way to increase responsiveness of technology supply markets to users' needs.

However, the established interpretation of network effects as network *externalities* does not provide for an explanation for how users can influence technology supply markets through non-market (collective) action except by collectively committing to buy a certain technology which is a rather unlikely course of action. An alternative explanation will be provided in this paper by giving network effects a different interpretation which focuses on the costs of purchasing/marketing a product rather than the benefits of its use, i.e. on transaction costs.

In the next section we will briefly recapitulate the literature on network externalities as it is relevant to the focus of this paper. In section 3 several problems resulting from interpreting network effects as network externalities will be identified. In section 4 we will discuss antecedents of a transaction cost theoretic model of network effects and provide some empirically refutable propositions. In section 5 the model is applied to analyzing the way

users of technological products can influence the range of choice available to them on IT markets. The concluding section summarizes the results and discusses some possible normative implications of our model with regard to the organization of user groups.

2. THE ESTABLISHED INTERPRETATION OF NETWORK EFFECTS

The classical formulation of the PNE concept has been provided by Katz and Shapiro (1985, 1986).[3] They also introduced the distinction between direct and indirect network externalities. Their major findings are (1) that network products will be supplied in a smaller quantity than is socially optimal (because consumers ignore the positive externality they exert on other consumers) and (2) that there is a strong tipping tendency if two "networks" are competing leading to consumers being "locked in" by the winning network. This latter effect, however, may be reduced by consumer heterogeneity and product differentiation. Reflecting on the emerging literature, Katz and Shapiro later (1994) conclude that there is no general theoretical support for an "excess inertia problem" when two systems are competing, meaning that the emergence of new technology need not be prevented by an existing network and its accompanying positive network externalities if that would be socially optimal. Indeed, they find that there can be "excess momentum" as well meaning that consumers may be too eager to adopt a new technology thus creating a bandwagon which leaves users of the old technology "stranded".

Farrell and Saloner (1985, 1986) use a game theoretic setting in order to explore the possible lock-in effect in more detail. As Katz and Shapiro they find evidence of possible excess inertia as well as of excess momentum whereby they focus on the question whether communication among supplying firms might eliminate these problems which, they find, is not the case although it might reduce them. In addition to Katz and Shapiro, Farrell and Saloner explicitly distinguish between two types of network externalities which are responsible for excess inertia and excess momentum respectively, namely those users of the existing technology exert on users of the new technology and those users of the new technology exert on users of the existing technology. Besen and Saloner (1994), also reflecting on the emerging literature, emphasize the "strong tipping tendency" in markets

[3] "There are many products for which the utility that a user derives from consumption of the good increases with the number of other agents consuming the good." (Katz and Shapiro 1985, p. 424).

characterized by network externalities. Moreover, they stress that it is the *expected* network size rather than the *existing* network size which matters. This point is made by Economides (1996) as well. Krugman (1991) demonstrates under which conditions the expected network size rather then the existing network size determines the competitive outcome. He finds that if either of the following conditions are fulfilled it is rather the existing network size which determines competitive outcomes: future flows of costs and benefits are strongly discounted; switching to the new technology takes a long time; external economies of scale (i.e., indirect network effects) are low.

Gandal and colleagues have conducted a number of empirical studies which seek to provide an empirical basis for the notion of positive network externalities (Gandal 1994, 1995, Dranove and Gandal 1999). As put forward there, the argumentation mainly rests on the empirically validated observation that users are willing to pay a premium for products which are compatible with a dominant standard. It is then concluded that, since compatibility with a dominant standard increases the potential market for suppliers of complementary products, indirect network effects are present because the increased market size for complementary products will increase the variety of complementary products on offer which is what is valued by consumers. Moreover, a two-way positive feed-back effect between the sales of complementary products has been found (such as CDs and CD-players; cf. Gandal et al. 1997).

However, there is a number of models which demonstrate that a similar effect can be constructed without the assumption of positive network effects in so-called "mix-and-match" markets, i.e. in markets where complementary products must be assembled to form systems by users. The reasons put forward differ. Economides (1989) argues that in a regime of compatibility profits (and prices) are higher than under incompatibility because price elasticity are greater in the latter case (a similar line of argument can be found in Matutes and Regibeau 1988). As a consequence, vendors have strong incentives to provide compatible products which, following a similar logic as above, increases variety of complements on offer and thus creates an equivalent to indirect network externalities. Desruelle et al. (1996) base their model on fixed costs which lead to external economies of scale in systems markets (Langlois 1992) which they interpret as a type of network effect. When the production of some components of a systems good is characterized by economies of scale due to the existence of fixed costs, the number of components supplied will increase with the number of users implying a higher variety of components, i.e. more components are available as the "network" increases in size which is valued by consumers.

The most prominent critique of the PNE concept has been put forward by Liebowitz and Margolis (1990, 1994, 1995, 1996, 1998). Their criticism rests basically on three arguments. Their first argument is that the distinction between direct and indirect network externalities is a crucial one and should not be blurred. Specifically, they point out that indirect network externalities resemble pecuniary externalities which are not socially harmful because they represent a transfer of wealth between producers and consumers (cf. Church et al. (2002) for a response to that critique). This leads to their second main criticism which holds that most effects described by using the PNE concept can be derived with traditional models of natural monopoly as well. Third and finally, they claim that another crucial distinction is missing in most PNE-based models, namely that between remediable network effects and those which are not. Only the former can be called true network externalities. They demonstrate that the circumstances under which true network externalities (as opposed to network effects which are not remediable) emerge are extremely rare and that all cases which are commonly used to demonstrate the existence of positive network externalities do not fall into this category.

3. WEAKNESSES OF THE ESTABLISHED INTERPRETATION OF NETWORK EFFECTS

Apart from the criticism voiced by Liebowitz and Margolis there are three other weaknesses in the established interpretation of network effects. The first is empirical. If the value of a network product increases with the size of the network (i.e. the number of buyers of that product) and if this implies a tendency toward network tipping, we would expect to find a number of examples where suppliers increase prices as the network is growing provided the network is proprietary, i.e. network externalities can be internalized by some suppliers. The empirical evidence put forward thus far does not clarify this point. Although it has been demonstrated that buyers are willing to pay a premium for compatibility (as mentioned above; see section 2) the conclusion that this is due to an increased network size is speculative. It could well be that buyers are only concerned with maintaining the value of their past and planned investments without considering the (expected) increase in the variety of complementary products resulting from an increase in network size through achieving (horizontal) compatibility between competing network products.

The second weakness concerns the actual mechanism through which positive network externalities are supposed to increase the benefit of buyers. This lack of clarity also contributes to some confusion surrounding the

concepts of lock-in and self-fulfilling prophecy respectively. If positive network externalities are assumed to arise due to the requirements of interacting with existing components of a system, i.e. through compatibility features, it is the existing size of a network which would be decisive. Then, it might be said that buyers are locked in because they cannot change to a newer (possibly better) technology if this is incompatible with existing components. In this case, buyers are not concerned with the future size of the network and, by implication, with the variety of components offered in the future.

However, if the latter is their true concern, any expectation of network size can be self-fulfilling if the future is not discounted too strongly, network effects (i.e. external economies) are not too weak and the adoption of the network does not take too long time as Krugman (1991) has demonstrated. In this case, the concept of lock-in (or path dependency) cannot be reasonably applied. In fact, we would expect to see the opposite: frequent adoption and rapid diffusion of new technologies.

Third and finally, indirect or "virtual" network effects sometimes seem to result from the combined effects of decisions concerning the degree of modularity and the degree of compatibility respectively. These concepts, however, need to be clearly separated.

Modularity designates an approach which decomposes a system into modules that can be mixed and matched as needed (Clark 1995). This, of course, requires that modules have common interfaces which allow for a measure of freedom in combining them, i.e. they need to be vertically and horizontally compatible to some extent.[4] Increased modularization of a system allows for increased levels of specialization and thus increased levels of economies of scale. If different firms (i.e. entities of ownership) specialize on these different modules, economies of scale become external.

It might be argued that an increased degree of modularity leads to increased variety of complements because (external) economies of scale imply lower prices as the network grows (if components are supplied competitively) which would make the network actually grow, given a normal demand curve. Thus, virtual network effects may emerge as the market for complements grows as well implying an increased number of different complements offered, i.e. an increased variety of complements (cf. Desruelle et al. 1996 for a similar argument). It is probably because of this implied virtual network effect that Economides claims that although the

[4] Vertical compatibility means that two complementary products can be combined without additional cost; horizontal compatibility means that two substitute components can be combined with the same complementary product without additional cost (cf. Economides 1991).

"mix-and-match literature" does not assume a priori the existence of positive network externalities, "it is clear that demand in mix-and-match models exhibits network externalities" (Economides 1996, p. 16).

A similar effect, however, may occur as a result of decisions about horizontal compatibility. If two firms offering substitute components agree on horizontal compatibility, they effectively increase the network size from the perspective of suppliers of complementary products, thus creating another indirect network effect (as would be the case if Microsoft and Apple agreed to making their operating systems compatible). This link between compatibility and indirect network effects has lead scholars to analyze the incentives of firms to offer their products under a "regime of compatibility" rather than as a proprietary system (which is accordingly called a "regime of incompatibility"; cf. Matutes and Regibeau 1988; Economides 1989).

Thus, although the decisions about the degree of modularity and about the degree of horizontal compatibility can have the same effect (a type of virtual network effect), the mechanisms accounting for these effects are quite different. Therefore, it seems desirable to model these mechanisms directly rather than to assume a chain of causal effects leading to some identical looking indirect effects which are treated as one and the same phenomenon.

To summarize, the problems of establishing an empirical basis for the PNE concept seem to stem from a lack of clarity in distinguishing between two sets of phenomena. First, it must be decided in which way buyers are said to benefit from increases in network size which will determine if the current network size (the installed base) or rather the expected network size is decisive for their buying decisions. Second, indirect network effects may be a result of either increased horizontal compatibility or increased modularization of systems. These two phenomena should be clearly separated for either a positive theory of network effects and a normative theory of regulation or, as in this paper, buyer behaviour.

4. A TRANSACTION COST THEORETIC INTERPRETATION OF NETWORK EFFECTS

In order to tackle the problems mentioned in the previous section it is necessary to adopt a more substantial approach toward new technology which goes beyond stylized examples such as the telephone network or the introduction of video recorders. First of all, it must be defined what is meant by "new technology". If Microsoft brings a new version of its operation system *Windows* to market, can we call this an introduction of new technology? Certainly, the introduction of a new version of an operating

system differs fundamentally from the introduction of a large-scale system such as the telephone network.

Next, the distinctions which have been identified above as necessary need to be made and operationalized in order to incorporate them in a model of network effects.

Finally, it must be clearly stated how costs and benefits depend upon various factors for both, suppliers and buyers. These factors should include the phenomenon of network size in an appropriate specification. This statement should be such as to facilitate empirical validation or refutation.

The following discussion will address each of these issues in turn. The results of this discussion will then be combined in a simple model.

4.1 The meaning of "new technology"

The analytical problem of clarifying the meaning of the term "new technology" rests on the observation that what might look like a radical innovation or technological revolution from a macroscopic point of view appears to be an evolutionary process of incremental innovation from a microscopic point of view (Schumpeter 1939, p. 227).[5] In order to avoid that difficulty the term "new technology" will be defined with respect to interaction properties between vendors and buyers of new technology rather than with respect to some properties of the technology itself.

Any technological artifact ("machine"), i.e. any physical artificial product incorporating technological knowledge, must embody a number of trade-off decisions concerning various performance and cost characteristics (Dosi 1982). This is clearly true for design quality vs. cost considerations. However, different performance characteristics must also be traded off against one another. For example, when IBM introduced its System/360 together with software automating systems operations (the operating system OS/360) in 1964, it assumed that users valued the comfort of having an operating system more than accompanying reductions in processing speed (Fisher et al. 1983, p. 118).

Thus in order to appropriately assess the value of a certain machine, users must be informed about the kind of trade-off decisions embodied in the new technology. This knowledge is both costly to acquire – for buyers – and to communicate – for vendors – and thus constitutes part of the overall transaction costs. We call the trade-off decisions embodied in a technological artifact *trade-off positions.*

[5] "... there is as little contradiction between them [the macroscopic and the microscopic point of view] as there is between calling the contour of a forest discontinuous for some and smooth for other purposes." (Schumpeter 1939, p. 227).

The term *new technology* can then be defined as follows. Whenever the existing knowledge of users is not appropriate to evaluate a machine's trade-off positions but must be newly acquired, the machine represents an instance of new technology. In contrast, if the performance characteristics of a machine are improved without changing its trade-off positions, users can rely upon the existing evaluation knowledge to assess its price/performance characteristics.[6]

4.2 Two types of transaction costs

From this definition of new technology follows that any firm offering new technology on the market must communicate knowledge about how to assess its new product properly or rely on potential buyers acquiring that knowledge by themselves, i.e. without the help of vendors.

In addition to these "vertical" transaction costs, there is a second type of transaction costs which needs to be considered when analyzing the special case of IT markets. IT markets are increasingly characterized by systems competition, meaning that the products offered by IT vendors are but components of a system which has to be assembled by the buyer or a buyer's agent (cf. Matutes and Regibeau 1988; Economides 1989; Desruelle et al. 1996; Church et al., 2002). A firm offering new technology on a market characterized by systems competition (systems markets) has not only to communicate new evaluation knowledge to buyers but also has to persuade other firms to offer complementary products. This requirement constitutes a second type of transaction costs for vendors offering information technology.

IT vendors can mitigate that effect by providing backward compatibility with regard to older components. However, this typically will sacrifice some of the advantages of the new technology. Therefore, vendors must balance the advantages of the "uncompromised" new technology against the demand for backward compatibility.

Distinguishing between these two types of transaction costs provides for the possibility of identifying two types of network effects which are linked to the size of the existing network and the size of the expected network respectively.

[6] This definition of *new technology* bears some resemblance with the notion of "Techno-Economic Paradigms" (TEP) which has been proposed by Andersen (1991). The TEP concept is itself an extension of Dosi's (1982) Technological Paradigms which has been modified to describe the interface between developers and users of new technology across a market interface. Accordingly, improvements of performance characteristics without changing embodied trade-off positions correspond to Dosi's/Anderson's concept of "normal technological progress."

Knowledge necessary for evaluating new technology properly can travel along the network of existing users by direct exchange (e.g. word of mouth on conferences). Thus, transaction costs resulting from the need to communicate evaluation knowledge to potential buyers will depend upon the size of the existing network (i.e., the number of past and current buyers).

In contrast, the difficulty of persuading potential developers of complementary products to actually offer the latter on the market will correspond to the perceived future size of the relevant market. The theoretical basis for this proposition is that the costs of developing new technology are largely fixed implying that economies of scale dominate the calculus of potential suppliers of complements. Thus, the second type of transaction costs will depend upon the expected network size.

The roles of the existing and the expected network size in the decisions of users and vendors of new technology can be summarized by the following two propositions.

> Proposition 1. The transaction costs (for vendors and/or buyers) resulting from communicating/acquiring knowledge necessary for potential buyers to accurately value new technology directly depend upon the number of past and current buyers of products incorporating that technology.

> Proposition 2. The transaction costs (for vendors and/or suppliers of complementary products) resulting from the need to persuade potential suppliers of complementary products to actually develop them and/or for these suppliers to assess the profitability of developing complementary products directly depend upon the expected total number of buyers of products incorporating that technology over its whole life cycle.

4.3 Degree of standardization and modularization

As shown in section 3, both the degree of standardization (i.e. horizontal compatibility) and the degree of modularization can be related to a kind of network effect. However, this approach involves several causal steps implying an increased degree of "indirectness" which makes empirical evaluation quite problematic.

The direct effects of decisions concerning the degree of standardization and the degree of modularization respectively are quite different.

As pointed out above (see section 3), increased degrees of modularization imply higher levels of (external) economies of scale which translate into

lower prices if components are supplied competitively as well as higher product variety (because lower unit costs may make the offering of a new product variety economically feasible). In contrast, increased standardization, on the one hand, increases the degree of competition between vendors of substitute components and, on the other hand, reduces implementation costs for buyers since the likelihood of being able to combine these components with existing or future complementary products without additional cost increases (Bresnahan and Chopra 1990).

Note that by this conceptualization compatibility with (dominant) standards enters the calculus of users on the cost side and not on the benefit side as is usually assumed in the PNE literature (which assumes that users prefer compatibility because of the then larger range of complementary products available; see section 2). However, these two approaches are not contradictory as the one adopted here models variety as ease of integration with existing or future complementary products. This seems plausible because "ex post" compatibility can always be achieved by technical means (adapters, converters) which, however, comes at a cost (which can be saved when standards are available). Thus, the direct effects of increasing the degrees of modularization and compatibility are modelled as cost savings rather then benefit increments.

The roles of standardization and modularization in the decisions of vendors and users of new technology can be summarized by the following two propositions.

> Proposition 3. As the degree of modularization increases, unit costs of supplying (developing, manufacturing and distributing) components decrease which translates into lower prices if components are competitively supplied and higher product variety.

> Proposition 4. As the degree of standardization increases, implementation costs for buyers decrease and competitive intensity for vendors of substitute components increases.

4.4 Outlines of the model

By conceptualizing network effects as cost savings, the question arises how to model the benefit of adopting new technology. For vendors, the benefit of offering new technology on the market is measured by revenues collected. Adopting a Schumpeterian perspective on competition, the main advantage of offering new technology (as opposed to existing technology)

consists of creating a temporary monopoly which allows for setting prices close to reservation prices, i.e. the maximum willingness of buyers to pay for the product. Reservation prices, in turn, are determined by net benefits of users (benefit minus costs of using new technology). As substitute products are offered on the market, prices will be driven down toward cost levels. Thus, the only remaining variable in the calculus of buyers and vendors to be determined is the benefit of *using* new technology.

In the PNE literature, a typical way to model the decision calculus of buyers is to distinguish between an "intrinsic value" of a product and the value added through the network effect. The intrinsic value is generally not specially considered and assumed to be distributed according to the requirements of the models used.

Since we have suggested to shift the network effect from the benefit to the (transaction) cost side of the calculus, the intrinsic value of the product remains the only factor on the benefit side of buyers' decision calculus. Rather than proposing hypotheses concerning functional forms for this intrinsic value, we will treat it as a variable in the model.

From the previous discussion it is now possible to specify the foundation of a transaction cost theoretic model of network effects in the following way.

The calculus of buyer j of new technology can be represented by the following equation:

$$r_j = b_j - c_j(s) - tc_j(x^i) \quad (1)$$

With:

- r reservation price
- b benefit of using new technology
- c costs of implementing new technology
- s degree of standardization of new technology
- tc transaction costs of acquiring knowledge about trade-off positions embodied in new technology
- x^i size of existing network (installed base)

The calculus of vendor i of new technology can be formulated accordingly:

$$\pi_i = \sum r_j - PC_i(m) - TC^c_i(x^i) - TC^s_i(x^e) \quad (2)$$

With:

- π profit of supplying the new technology
- PC production and distribution costs of supplying new technology
- m degree of modularization

TC^c transaction costs of communicating knowledge about trade-off positions embodied in new technology

TC^s transaction costs of persuading other firms to supply complementary products for new technology

x^e expected network size

Recognizing that in equation (2) it does not matter whether transaction costs for acquiring/communicating knowledge about trade-off positions embodied in new technology are carried by buyers or vendors, we redefine r and define TC^{cm} as follows:

$$r \equiv b - c(s)$$
$$TC^{cm} \equiv TC^c + tc$$

Which yields:

$$\pi_i = \sum r_j - PC_i(m) - TC^{cm}{}_i(x^i) - TC^s{}_i(x^e) \qquad (3)$$

As a firm will offer new technology only if it expects profits to be higher than those of offering existing technology, equation (3) must be compared with the profit of supplying existing technology. Since prices for existing technology will be determined by marginal cost and intensity of competition rather than reservation prices, the profit of supplying existing technology is:

$$\pi^o{}_i = x^{oe} * \{dPC^o{}_i/dx^{oi} + z_i(t)\} - PC^o{}_i(m) - TC^{ocm}{}_i(x^{oi}) - TC^{os}{}_i(x^{oe}) \qquad (4)$$

With:

π^o profit of offering existing technology

x^{oe} expected size of the network of existing technology

PC^o production and distribution costs of supplying existing technology

x^{oi} size of installed base of existing technology

z profit margin of existing technology[7]

TC^{ocm} sum of transaction costs of communicating and acquiring knowledge about trade-off positions embodied in existing technology

TC^{os} transaction costs of persuading other firms to supply complementary products for existing technology

[7] We assume that z decreases with time since the longer the product is on the market, the more any proprietary advantage the technology might originally have had will disappear; defining $z(0)$ as the profit margin at the time the new technology is introduced on the market and $z(t') = 0$, the value of t' provides a dynamic measure for the degree of competitive intensity in a given industry.

New technology will only be offered if there is at least one firm for which holds:

$$\pi > \pi^{o} \tag{5}$$

5. HOW BUYERS CAN INFLUENCE PRODUCT DECISIONS OF VENDORS

There are two principal ways in which buyers can try to influence the range of choices of technological alternatives available to them on the market.

First, they can try to take on an active role by specifying their requirements concerning technological products and then communicating these to potential vendors. This approach, however, is likely to meet with serious coordination problems as the mixed results of user groups' attempts at exerting direct influence over product specifications indicate (Burrows 1999). This is because new technology, by its very nature, is still open to change so that buyers likely disagree on the future course of desirable technological development since any one buyer would like to see their special requirements implemented. Thus, reaching consensus on the course of future technological development seems unlikely.

Moreover, buyers need to commit to these specifications in a credible way implying that they would have to shun those vendors whose products do not comply with the required technical specifications. This type of collective commitment is even more difficult to achieve. Consider the example of the up to now biggest effort in forcing vendors of new technology to adopt buyer-defined specifications, the GM initiated and sponsored MAP[8] process. This effort failed due to a lack of degree of coordination on the side of buyers sufficiently large to translate into a credible threat to vendors who are hesitant to adopt these specifications (Besnahan and Chopra 1990, Dankbaar and van Tulder 1992).

Note that this possible course of action is the only way buyers can influence the range of technological options offered on the market if one resorts to the theory of positive network externalities for both of its possible mechanisms, increasing benefits due to an increase in the size of the existing as well as the expected network.

The interpretation of network effects proposed in this paper, however, suggests a second possibility for influencing the course of technological

[8] MAP: Manufacturing Automation Protocol.

development through collective action. If the effect of the existing network size is to facilitate acquisition of knowledge about trade-off positions embodied in new technology, user groups can "artificially" create such an effect even if the existing network of users of the new technology is relatively small. By promoting knowledge about trade-off positions embodied in new technology, they can significantly reduce transaction costs of supplying/purchasing new technology. If user groups could commit to acting as this type of communication platform, the effect may be sufficiently large to trigger the development of new technology which otherwise would not be developed.

In order to explore this idea formally, consider the formulation of a vendor's calculus as developed in section 4.4 for a preliminary analysis. In order to isolate the effects user groups might have on transaction costs of supplying/acquiring new technology, assume the following: (1) Production costs are the same for both, the new and the existing technology; (2) similarly, the ultimate expected network size is identical for both technologies, i.e. $x^e = x^{oe}$; (3) reservation prices are similar for all buyers. Then, inequality (5) reduces to:

$$x^e * r - x^e * \{dPC^o_i/dx^{oi} + z_i(t)\} > TC^{cm}_i(x^i) - TC^{ocm}_i(x^{oi}) \qquad (6)$$

One way to analyze the decision situation of a user group then consists of expressing the extra benefit which a user derives from deploying new technology as compared to the benefit of deploying existing technology as a function of the existing network disadvantage because this extra benefit provides a source of extra profit for the vendor due to its temporary monopoly situation. If there would be a way of knowing how "artificially," i.e. by collective action of user groups, reducing the network disadvantage impacts upon this extra profits of vendors, user group could assess the likelihood of success of such efforts.

For this purpose define:

$$dPC^o/dx^{oi} + z(t) \equiv p$$
$$r \equiv p + tp$$
$$x^{oi} \equiv x^i + nd$$

With:

p market price of existing technology

tp temporary profit of supplying new technology corresponding to the extra benefit of deploying new technology rather than existing technology

nd existing network disadvantage of new technology

Then, inequality (6) becomes:

$$tp > 1/x^e * \{TC^{cm}_i(x^i) - TC^{ocm}_i(x^i + nd)\} \quad (7)$$

In order to further explore this relationship it seems practical to determine a functional form for *TC* and TC^o.[9]

Since the effect of the existing network size on potential buyers consists of providing a communication channel between existing and potential buyers of technological products, it is possible to use diffusion theory for determining a proper functional form. Diffusion theory claims that innovations spread through a population of potential users as a result of a type of "infection mechanism." As potential users learn about new technology from current users, they become "infected" and start to use the technology themselves (cf. Rogers 1983, p. 245). Accordingly, diffusion of innovations follows an S-shaped or "logistic" pattern known from the spread of diseases because initially, when the fraction of current users is still small, the chances of "infecting" new users through direct contact are still high; however, as the share of current users increases the probability of meeting an "uninfected" member of the population begins to decrease because more often than not one current user will meet other current users.

Whereas diffusion theory measures the spread of knowledge in a given population of potential users as a function of time, the underlying mechanism consists of communication between current users and potential users. Only when assuming that current users keep communicating the same "amount of information" per unit of time is it possible to express the spread of knowledge as a function of time. The more direct (and for our purposes the more useful) way of modelling that dependency consists of expressing the spread of knowledge as a function of the number of current users (who, via their communication activity, effect the actual spread of knowledge) which then can also be represented by a logistic functional form.

Because the network effect identified here also depends upon the spread of knowledge about new technology, the "epidemic" growth pattern of diffusion theory must also hold for TC/TC^o. Furthermore, since an existing network of users facilitates communication of evaluation knowledge necessary for making the purchasing decision, transaction costs of communicating that knowledge actually decrease as the network and thus evaluation knowledge grows when seen from the vendor perspective since an ever larger share of the total transaction cost burden will be taken over by the network. Thus, as evaluation knowledge about trade-off positions embodied in new technology travels through the population of potential

[9] As in this expression TC^s does not appear, we drop the superscript *cm* for TC^{cm} and TC^{ocm} from now on.

users, transaction costs of communicating/acquiring that knowledge decrease accordingly. This relationship is depicted in Fig. 1.

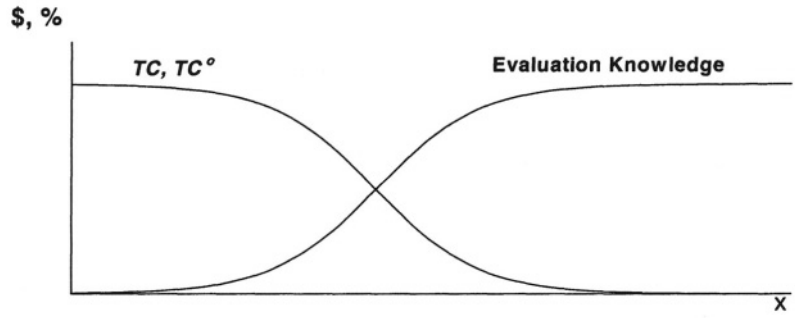

Figure 1. Deriving *TC* and TC^o

According to inequality (7), the extra benefit *tp* of new technology must be bigger than the difference between $TC(x^i)$ and $TC^o(x^i + nd)$ times the reciprocal of the expected network size if the new technology is to be offered on the market. Assuming that *TC* and TC^o have the same form and identical parameters, a function representing inequality (7) – denominated by *F* – can be derived from the shape of TC/TC^o. Starting with an *nd* value of 0, the differential between $TC(x^i)$ and $TC^o(x^i + nd)$ first grows with increasing and then with decreasing rates which gives another logistic pattern for *F* (see Fig. 2). If *F* is constructed for values of *nd* bigger than zero, the part of the curve which exhibits increasing growth rates will be diminished accordingly. As *nd* grows beyond 50% of the population of potential users, *F* begins with decreasing growth rates, i.e. there is no area of increasing growth rates.

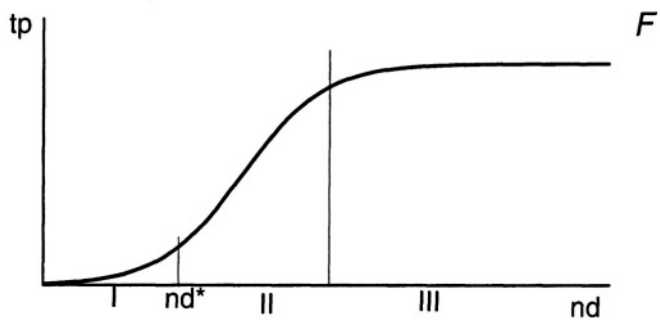

Figure 2. Phases of Potential User Group Activity

The logistic pattern of the relationship between the extra benefit of new technology required for triggering its actual supply and its network disadvantage implies that *nd* has a significant effect on *tp* only for intermediate values of *nd* (area II in Fig. 2). If user groups want to facilitate the supply of new technology, the likelihood of success of such action increases significantly if they can create a communication effect larger than *nd**. Thus, users have a means of actively affecting the range of choices offered to them on technology supply markets by *reducing* the degree of a new technology's superiority required to induce vendors to actually develop and supply that technology.[10] From the point of view of positive theory, in turn, the implications of this model can then be summarized by the following proposition:

> Proposition 5: Other things being equal, the frequency with which a new technology seen as superior by buyers replaces entrenched technologies increases with the degree of collective user action aimed at improving the communication flow among users, for example through setting up and running user groups.

6. CONCLUSIONS

Based on a transaction cost theoretic interpretation of network effects, the analysis presented in this paper suggests how users can actively influence the range of technological choices on markets for new technology through collective action other than by collectively committing to only buy products incorporating the new technology. This latter alternative would be the only way for users to affect the course of technological development if one relies on models which interpret network effects as positive network externalities.

[10] Note the difference of this approach to that suggested by Witt (1997) who demonstrated how in a model based on the notion of positive network externalities the likelihood of an entrenched technology to be replaced by a new (possibly superior) one can be expressed as a function of the new technology's superiority: "In principle, there is always a chance of overcoming what appeared ... to be an inescapable "lock-in" situation produced by increasing returns to adoption—if the new variant is sufficiently superior to the established one." (ibid., p. 768). Thus, the cumulated positive externalities of the old technology have either to be compensated by the new technology's superiority and/or by some subsidizing scheme to reach a critical network size in order to be dislodged; in any case, buyers would have no means of affecting the course of technological development other than by developing the new technology themselves or collectively committing to buy (only) products incorporating the new technology.

According to the model presented in this paper, the type of collective user action required for widening the range of technological choices on markets for new technology consists of providing a communication platform for the exchange of technical and economic information about new technology. It has been suggested that the likelihood of success of such action significantly increases if the extend of communication among users exceeds a critical value which can be expressed by the relative disadvantage of the new technology's network size. The model is based on propositions which are formulated in a way allowing for empirical refutation. Moreover, the model predicts that the frequency of instances in which a superior technology (i.e. one regarded as superior by users) replaces an entrenched technology is related to the extend of information exchange among users (other things being equal), a proposition which lends itself to empirical testing as well.

The model presented in this paper also has a rather practical implication. User groups tend to be organized around existing products of specific vendors. This is, in no small part, due to their need of obtaining sufficient financial resources for their own operation and administration which is frequently provided by the vendors. However, such practice rules out the communication effect of user groups which has been described in this paper as facilitating the supply of a greater variety of technologies on IT markets. Achieving this effect requires that user groups comprise users of *different* technologies so that sharing of knowledge regarding their respective economic and technical characteristics becomes possible. Vendors of existing products will normally not have sufficient incentives to incorporate new technologies into their products lest they cannibalize their own revenues. Thus, entrenched technology is most likely replaced by newcomers or rivals (Martin and Mitchell 1998). However, any supplier of a competing product incorporating new technologies would face the daunting task of overcoming the huge communication disadvantage created by the size of the user network of the existing technology (thus increasing the supplier's transaction costs relative to those of the supplier of the existing technology). A user group may help to reduce the magnitude of this disadvantage only if it mixes users of different technologies and, by implication, brands. This, at least, is what the model we have presented in this paper would suggest. Thus, increasing the variety of technologies offered on technology supply markets, which would be one way of increasing the responsiveness of technology supply markets to changing user requirements, would require a different type of user group, one actively managed (and financed) by users formed around *specific types of user requirements* rather than products and brands. However, this conclusion is derived from a hypothetical model of technology supply markets and should

be empirically validated before it can be recommended to practitioners as a guideline for action.

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Chapter 9

EXPLORING APPLICATION SERVICE PROVISION

Adoption of the ASP concept for provision of ICTs in SMEs

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Abstract: The paper provides an exploratory empirical survey of Application Service Providers (ASPs) and their clients. The research question is: what do Small and Medium-sized Enterprises (SMEs) base their decision on when adopting the ASP concept? The concept, ASP, consists of software vendors, and an ASP enterprise, which act as a third part firm in a business model. For its clients it forms a strategy to "buy-in" applications and organize maintenance for their Information and Communication Technology (ICT). The ASPs report cost control and lower cost as motives for SME's decision to adopt the ASP concept. The clients do not emphasize these reasons. However, a closer examination of the decision shows that the cost perspective is secondary to SMEs. The study identifies three main reasons for clients to adopt the ASP concept: core competence, a lack of skilled personnel and the organizations overall strategy.

Key words: Adoption of Application Service Provision, SMEs.

1. INTRODUCTION

The use of Application Service Providers (ASPs) as a provider of Information and Communication Technology (ICT) has been expected to grow a lot. ASPs are often seen as a way for Small and Medium-sized Enterprises (SMEs) to get the possibility to use ICTs to increase their effectiveness and efficiency. At the same time the ASPs struggle with the fact that their inflow of new customers is low. Most reports about the ASP concept are predictions about the growth of the market for ASPs. Kern et al. (2001), for instance, mention that there were over 1,000 companies that

claimed to be ASPs during the second quarter of 2001. This can be compared with Lacity & Willcocks (2001) who say that only 200 firms fitted the ASP definition by mid-2000. Lacity & Willcocks (2001) predict that the ASP market will rise from US$ 150 million in 1999 to between US$ 11.3 billion and US$ 21 billion by 2003. Firms such as Gartner Group, IDC and Ovum forecast potential market sizes of up to US$132 billion by 2006 (Kern et al., 2001).

Although the ASP concept is often seen as an exhausted trend, it is commonly considered here to stay. But the question often asked is whether customers have a demand for ASPs? Our impression is that there is a lack of customers. Gartner Group in 2000 (Kern et al., 2001) predicted that 60 per cent of the ASPs will be out of business.

A few words about the abbreviation ASP might be in order. ASP can be used in different ways. And here are some of its different meanings. It is often used as identification of some enterprises acting as service providers, or as a concept. This means that ASP describes the whole idea about delivering and buying ICT services from an ASP enterprise. ASP is also described as a business model, where the service provider organization is seen as a third part firm, delivering software applications from independent software vendors. The ASP business model thus consists of suppliers and clients where the ASP enterprise acts as both supplier and client. ASP can also be seen as a product, which service providers sell to their customers'. Another way of using ASP is to label it as a strategy. As such, ASP can be viewed as a way for clients to provide themselves with services, and the action that customers take when they use a service provider for the delivery of their applications. In this paper ASP is used with these different meanings, which are indicated separately. But generally speaking, ASP is used as a term for the enterprises that deliver the services.

The aim of this paper is to present and discuss findings from a pilot study on the reasons that spur an SME to adopt the ASP concept. It also describes the reasons ASPs cite for SMEs to adopt the ASP concept. The findings are compared with the literature addressing these reasons.

The paper starts with a short introduction to the ASP concept. Section three discusses the reasons SMEs give to adopt or discard services from ASPs as reported in the literature. Section four presents three ASPs and three related clients. The final section summarizes and discusses the results.

2. THE CONCEPT OF APPLICATION SERVICE PROVISION

The ASP concept can be seen as selective ICT outsourcing. The outsourcing market is vibrant and receives a great deal of attention. Outsourcing is not a new phenomenon. As early as mid-1960s there were computer service bureaus, which ran a variety of systems for external clients (McFarlan & Nolan, 1995). These systems were mainly financial and operational applications. And ever since Kodak decided to rent its ICT resources from an external partner in 1989, there has been a trend towards ICT outsourcing (Hirschheim & Lacity, 2000). Many large companies have decided to transfer their ICT assets, leases, and staff to a third part (Lacity & Hirschheim, 1993). The degree of ICT outsourcing varies a lot. Some companies outsource just a few ICT functions while others outsource their entire ICT operations (McLellan et al., 1998). In recent years we have seen in the outsourcing market a growing number of ASPs start-ups and companies offering their products and services through the ASP concept.

The core of the ASP concept is for the ASPs to offer applications to external customers. The applications can be IT-related, but they are not the only thing that ASPs can offer. An ASP enterprise can, for example, also be some kind of information broker. Puelz (2001) describes an ASP enterprise that benchmarks data from 16 financial institutions. However, the most common way to describe ASPs is as providers that offer software applications, which they manage and deliver to external clients (e.g., Cherry Tree, 2001; Kern et al., 2001; Currie & Seltsikas, 2000). The clients then use the application in their own businesses, where the types of software applications are in areas such as web site hosting, payroll/billing, e-mail, e-commerce and ERP applications.

Kern et al. (2002a) describe the difference between an ASP option and other ICT sourcing options. They mention four general ICT sourcing models: insourcing, buy-in, traditional outsourcing and the ASP option. The difference between an ASP option and the other ICT sourcing models is that the resource ownership is on the supplier side. The ASP option is also a one-to-many supplier to customer relationship. Kern et al. (2002b) select the term netsourcing as the overarching name, because the common element in the ASP option is the delivery of a product or service over a network. The primary product an ASP enterprise delivers is remotely managed business applications.

The ASP concept here is defined as *an ASP enterprise – a third-party firm – that deploys, manages and remotely hosts software applications through centrally located data centres on a pay-as-you-use basis. For the*

client the ASP business model is a strategy to "buy-in" applications and organizing ICT maintenance.

Having defined ASPs and the ASP concept, the remaining question is: what reasons are there for SMEs to adopt or drop the ASP concept?

3. REASONS FOR ADOPTING OR IGNORING THE ASP CONCEPT IN SMEs

Kern et al. (2001) point out three reasons why an SME should adopt the ASP concept. First, even though a package software license is cheaper than an in-house developed solution, it is still the case that many SMEs cannot afford the packaged solution costs. Second, an SME will be unable to attract and afford the necessary ICT staff. Lastly, the packaged applications require an established ICT infrastructure and connectivity to ensure optimal performance. For an SME it is difficult to retrieve the necessary human and financial resources to support and continually develop such ICT infrastructures. The ASP concept can also be seen as a way for SMEs to take advantage of the rapidly changing opportunities in ICT (e.g. Turban et al., 2001; Currie & Seltsikas, 2000). An ASP enterprise can assist SMEs with ICT skill, especially in the development and software maintenance areas (Kern et al., 2001). Dewire (2001) argues that there are eight different conditions for an organization to adopt the ASP concept. They are: if there is a need for flexible ICT infrastructure; if the organization cannot afford a huge IT capital outlay; if it does not have the necessary capital resources; if it needs to scale its ICT infrastructure quickly; if it needs to switch to another environment in the near future; if it needs to deploy applications rapidly; if the organization finds it difficult to attract and retain ICT staff; and finally, if ICT is not a core competency.

The close connection between ICT outsourcing and the ASP concept makes it possible to increase the knowledge about reasons for adopting the ASP concept by comparing it with reasons for ICT outsourcing. One commonly quoted reason for ICT outsourcing is the provision of increased flexibility to cope with changes in technology and in the business environment. Paradoxically, the traditional ICT outsourcing agreement is based on long-term contracts that rather tend to inhibit than facilitate change (Shepherd, 1999). One of the ideas with the ASP concept is to make it possible to have a short-term agreement. According to Lee (2001), outsourcing is motivated by strategic, economic and technological benefits. Shepherd (1999) argues that for the majority of organizations the motives for ICT outsourcing could be summarized as a combination of financial restructuring, reducing or stabilizing costs, overcoming cultural and

organizational problems, concentrating on core competencies and accessing world-class expertise.

McLellan et al. (1998) give five groups of reasons for ICT outsourcing: financial motivations, the internal IT department does not respond to organizational needs, strategic motivations, to improving long-term business performance and to facilitating strategic change. Whether an organization should outsource its ICT or not is principally a question of what strategy the organization has (Weill & Broadbent, 1998).

According to De Loof (1995), external suppliers of ICT sourcing do predict large cost reduction, improvements in quality and higher responsiveness if customers hand over their ICT function to them. He also states that reports from outsourcing are often overly optimistic. The result is that many organizations are in doubt if there are any benefits for them with outsourcing. Udo (2000) says that there is a trend among organizations today to classify ICT functions into two categories according to the kind of services they deliver, commodity services and strategic services. Udo (2000) maintains that commodity services can be outsourced without any qualms, but strategic services should never be outsourced. However, Udo reports Lacity & Hirschheim (1993) as mentioning that this categorization can lead an organization to acute problems in the future. The reason is that commodity services at present can be of high strategic importance for the organization in the future. According to Udo (2000), the outsourcing providers state that outsourcing has the following benefits:

- A predictable ICT budget is gained by tying it to actual requirements. This budget is then not dependent on which hardware and software that are present in the organization.
- A lower cost for ICT, which means cost savings compared to both the current as well as the future expenditures of ICT equipment.
- Access to technical resources and technical skilled personnel are increased
- The organization can focus on core products and services, and does not have to handle operational issues.
- The organization's fixed costs for ICT can be exchanged to variable costs, which means that it is possible to invest this capital in core business.
- By outsource the risks in development applications are spread with the technology partner.

But as stated above, Udo (2000) also claims that some observers believe that outsourcing has more disadvantage than advantages. The following potential disadvantages are reported:

- There is a lack of chemistry between the partners
- Reliance on another party for the organization's critical information.

- Loss of capability, which in the future can be a key success factor.
- Loss of control of ICT assets.
- Threat of opportunism from the supplier.
- Loss of flexibility.
- Loss of competitive advantage in information management.
- Loss of ICT expertise and as a consequence loss of memory in the organization.
- Decline in morale and performance of the remaining employees.
- No guarantee for long-term cost savings.

Baldwin et al. (2001) argue that a selective sourcing approach with the opportunity to use several different suppliers is an increasingly popular strategy to minimize risks, maximize benefits and reduce costs. The question is if an SME, after deciding to use an ASP strategy for its sourcing of ICT, would choose to cooperate with different suppliers or it would minimize the risks, maximize benefits and reduce costs in another way.

Jurison (1995) summarizes the motives for outsourcing or not outsourcing of ICT. He states that the primary reason for ICT outsourcing is indicated by economic reasons, i.e. economic consideration in different forms is the primary driver for an ICT outsourcing decision. He mentions risks as the primary reason for not choosing an ICT outsourcing option, where the irreversibility of the decision is seen as the dominant risk.

4. THREE ASPS AND THREE RELATED CUSTOMERS

This section presents the empirical survey and the organizations that are part of it. Each ASP is labelled according to Currie & Seltsikas, (2000, 2001) categorization of Asps. The authors classify ASPs into five different groups in the light of the product(s) they deliver: Enterprise ASPs, Pure-Play ASPs, Vertical ASPs, Horizontal ASPs and ASP enablers. This section also describes three SMEs that are clients to the three ASPs. It is based on semi-structured, open-ended interviews done at the companies. The interviews lasted between one and a half to two and a half hours each. The persons interviewed have the following functions: in two of the ASPs they are sales manager, in the third ASP enterprise the interviewee is president of the ASP department in the organization. The interviewee in the customer organization has the following functions: president at the manufacturing company A, president at the travel agency, and IT manager at manufacturing company B. The interviews were tape-recorded and then transcribed. The interviews with the ASPs were based on two overall questions: what is it that they deliver? And why should an SME adopt the ASP concept? In the interview with the customer there were also two questions: what are the services ASPs deliver?

And why did they adopt this solution for their ICTs? The following sections present the organizations and discuss the two overall questions.

4.1 The Horizontal ASP

The horizontal ASP-company (HASP) is a consultancy firm located in Denmark, Norway and Sweden. It is the product of mergers of three different companies: an Internet Service Provider (ISP), an IT-consultancy and an ASP-firm. The HASP-company offers flexible solutions to its costumers, which is a base block and/or customer-specific. The company's data center, in combination with ISP service and IT-consultancy experience, makes it a competitive player in the ASP market. SMEs are the company's market segment. According to Currie & Seltsikas (2000) is an ASP categorized as a horizontal ASP if it offers collaboration tools and other applications to a broad base of customers'. Their focus is on business processes. The examined ASP fits this description in that they do not focus a specific industry. Instead they try to support their customers with all ICT applications they need, which means that they have a portfolio of around eighty to ninety applications.

For the HASP-company, the main reason for adopting the ASP concept is cost control. The interviewee described customers' ICT cost control and awareness as very low. The HASP-company uses a total cost of ownership (TCO) analysis to describe to customers its present ICT cost. The figures can be compared with what an ASP solution will cost.

The HASP-company sees two main reasons for a customer not to choose an ASP solution: 1) security concerns and 2) data control concerns.

4.2 The Vertical ASP

The vertical ASP-company (VASP) is a subsidiary of a larger consultancy firm located in Sweden. The consultancy firm consists of many different departments, where each department focuses on a specific market. The role of the VASP-department is twofold. First, to be a supplier to other departments in the company. When other departments sell a system or a system-license, they can also propose to the customer system support and management. This service will be done by the VASP-department. Second, the VASP-department markets and sells products using internal sellers and external partners. The VASP-department's market segment is SMEs. According to Currie & Seltsikas (2000) is an ASP categorized as a vertical ASP if it offers targets a specific market sector. Their focus is to support the customer in that specific area with ICT applications they need to do business in that area. The ASP in this section does not exactly fit this description.

However, they do not focus on providing all kinds of ICT applications. They have in their portfolio around ten applications. They state that they will not provide any application, which they do not have knowledge about, and they rely on an external company to handle it.

According to the VASP-company, there are three main reasons for SMEs to adopt the ASP concept. First, the organization has an overall strategy, implying that it should not handle anything that is not directly connected to its main businesses. Second, the organization's desire to have control over its ICT costs. And finally, the lack of possibilities to handle necessary service and support on its own. The VASP-company says that the main reason for not adopting the ASP concept is the client's fear of losing control over its ICT.

4.3 The Enterprise ASP

The enterprise ASP (EASP) is a global company operating in the ERP market. The company develops and markets its own ERP-system. It sells, licenses, implements and supports the ERP-system. The company initiated a new department in 1998 in which it marketed itself as an ASP-company. However, it was not until 2000 when it actually started to do business. The reason for starting an ASP business was to become a more interesting partner for its customers'. The EASP-department also wanted to take part of the expenses that its customers put on system support and management. When the business started it was intended to be a horizontal service provider, offering all the systems the customers needed. There are two reasons why this has not been fulfilled. The EASP-department planned to use a partner operating as a horizontal ASP-company, but the partner went bankrupt. The department also found out that its customers did not appreciate the horizontal service provider offering. The customer segment ranges from medium to big-size enterprises. By doing business as an ASP-company it also wants to become a possible partner for SMEs. An enterprise ASP is, according to Currie & Seltsikas (2000), an ASP that offers customers an end-to-end enterprise solution. These companies can both be ERP vendors as well as their partners. The focus of enterprise ASPs is to provide their customers with a company-wide solution. The EASP in this case is an ERP vendor that provides its own ERP-system.

The main reason the interviewee gives for adopting the ASP concept is cost control. But there is also the possibility to spread out the investment on a longer time-period. The primary reason for not adopting the ASP concept is based on some thoughts about loss of control, expressed by the interviewee in the following way, *"If the servers are not placed in the clients own building the clients will have the feeling that they are losing control"*.

4.4 Manufacturing Company A

This company has cooperated with the horizontal ASP-company (Sect 4.1) since 1999. Previously, it used the same provider for part of its ICTs. The provider at the time acted as a service bureau, so the choice to become an ASP customer has never really been there. The choice was there by the end of the 1990's when the company discussed if it should go back and handle its ICT by itself. It decided not to do so as it was satisfied with the services from the service bureau. It took this decision because it would have cost it too much to build up its own competence again. The company realized it would have difficulties attracting skilled employees. As a manufacturing organization, the company, in the words of its owner, is basically very dependent on ICT. In his opinion, it needs to use the latest technologies to be in the forefront. The ASP concept, the owner adds, is a good way to achieve this. The difference between the ASP solution and the earlier service bureau solution is that in the case of the latter the provider manages all ICT today. At the beginning it was only the organization's ERP system that was managed by the service bureau. At present, and except for some CAD/CAM systems, the provider handles all ICTs. The organization considers ASP solution to be the right solution, and it does not see any problem whatsoever with this solution. Regarding the selection of a particular provider the company undertakes an investigation. However, it was the geographical location that finally made it choose this current provider.

The main reason for adopting the ASP concept is convenience, according to the interviewee. He expresses this in the following way, *"We wanted to have the possibility to have an external partner to handle our ICT and not deal with all those troubles by ourselves"*. Another reason the interviewee mentions is that it is easy to deal with the upgrades of the ICTs. The interviewee is concerned about trust of the communication links and sees them as a main reason for not adopting the ASP concept.

4.5 The Travel Agency

The travel agency is a small firm selling and arranging sports and concert trips. It has been in business since 1997. Since 2000, it has been cooperating as an ASP customer with the vertical ASP-company (Sect 4.2). The systems that the agency uses and rents are Microsoft Office and TOIs. The latter is a booking system for travels. This system was at first handled as a customer-specific ASP, i.e. the data was executed on an own server at the ASP-company. After a while the ASP-company transferred this system to a server

where another enterprise system was running, turning the agency into a pure ASP customer. This slashed the monthly fee by 20 per cent.

The main reasons for adopting the ASP concept are, according to the interviewee, the focus on core competence and security concerns. "W*e should concentrate on our core business and ICT is not our core business* and *we need and must trust that our ICT works all the time. That's why we adopted the ASP concept,"* the interviewee said. One reason for not adopting the ASP concept could be that *"it can be hard to get a new ICT-system accepted by the ASP-firm,"* the interviewee asserted. It takes some time before a customer's proposal or request for new services can be used in the business.

4.6 Manufacturing Company B

The manufacturing company is a global company that delivers equipment to the pulp industry. It has been in business since 1899. It operates globally with its own offices in the Nordic countries and representatives beyond. Today it cooperates as an ASP customer with the enterprise ASP (Sect 4.3). It has done this since the beginning of 2000. Earlier it used the same ERP-system, but it did all the support and services itself. This was working very well but it developed some problems with the system. Nonetheless, it decided to rent the ERP-system from the enterprise ASP. There were mainly two reasons for doing so. First, the company's system was a bit rough. It discovered that it had to change server every second year if the system was to run smoothly. It had hitherto worked with this system for a little more than two years. Second, it was hard to update the system and keep enough knowledge about it in the company. At the same time the enterprise ASP started its business and the company decided to try it. Potential drawbacks that can be a motive for not adopting the ASP concept are, according to the interviewee, the company's heavy reliance on the ERP-system and its non-stop operation, which means that the communication link is vulnerable.

5. FINDINGS OF THE STUDY

The findings of the empirical study are summarized in two tables. Table 1 shows the main reasons reported for adopting the ASP concept, and table 2 shows the main reasons reported for non-adoption of the ASP concept. All providers emphasize the cost control as one of the main factors for adopting the ASP concept. This finding concurs with one of the reasons, Udo (2000) provides and labels it as a predictable ICT budget. The customers on the other side do not emphasize the cost control as a main factor.

Table 1.Reported Reasons for Adoption of the ASP Concept.

	ASPs reported reasons for adoption	ASP customers reported reasons for adoption
The HASP-company	Cost control	Convenience
		Easiness to upgrade
The VASP-company	The overall strategy	Focusing core competence
	Cost control	Increase security
The EASP-company	Cost control	Resource constraints
	A way of financing	Hard to be knowledgeable

The reasons in table 1 that the SMEs put forward for adopting the ASP concept can be grouped together under the label core competence. Despite the fact that it is only one of them that directly expresses it, all customers use the words core competence when they asked why they adopted the ASP concept. Core competence should then be seen as the organization's core business, of which it has enough knowledge about, and available resources to handle in an efficient and effective way. One of the service providers also give this as one reason, label it as the organizations overall strategy. This can be compared to Gorla et al's (2002) statement, saying that there are many articles trying to explain the determinants of outsourcing. These articles focus on the following four explanations. First, outsourcing is chosen because the enterprise wants to focus on its core business. Second, cutting costs is the main reason for outsourcing. Third, a lack of expertise and qualified personnel forces the enterprise on outsource. Fourth, outsourcing is the first step to a business process re-engineering. The first and third explanations are supported by this study. These are also two out of three reasons that Lee (2001) expresses. The third explanation economic benefits that Lee gives as a reason are not supported by the findings.

Gorla et al. (2002) arrive drive at the following conclusion: ICT outsourcing is mainly influenced by market structure and ICT outsourcing costs. However, the study does not fully support this conclusion. The main findings instead demonstrate that costs are not a determining factor in the decision of adopting the ASP concept. SMEs in this study emphasize costs, but when it comes to the final decision, costs are not the primary reason. The reasons the SMEs cite are: difficulties with handling and acquiring resources, a lack of internal resources, ICT is not their core competence, and a wish to increase security.

When it comes to reasons reported for non-adoption, the providers' statements can be compared to Udo's reported disadvantages. One of the disadvantages reported by Udo is that outsourcing leads to loss of control over ICT. All three providers emphasize customers' fear of loosing control over ICT as a reason for the non-adoption of the ASP concept. The customers' on the other hand do not state this as the reason for non-adoption.

The reason they instead put forward is concern about the communication link.

Table 2. Reported Reasons for Non-adoption of the ASP Concept

	ASPs reported reasons for non-adoption	ASP customers reported reasons for non-adoption
The HASP-company	Security concerns Data control concerns	Trust of the communication link
The VASP-company	Fear of losing control	Considerable time for implementing
The EASP-company	Fear of losing control	Concerns about the communication link

One of the customers states that the long time for implementing can be seen as a reason for non-adopting. However, this customer also discuss the communication link and see it as the most critical part with its solution for provision of ICT at the moment.

6. CONCLUSIONS

The primary reasons the ASPs give are: first, customers choose to adopt the ASP concept because they know what costs they have to pay for ICT each month. Second, the customers adopt the ASP concept because they cannot provide themselves with the same ICT for the same cost. This is quite contrary to the reasons the customers report. The customers of course say that they would like to have their ICT as cheap as possible. However, this is not reported as the key reason for adopting the ASP concept. The customers also shows this when they decide on which ASP to choose. When it comes to the final decision of the specific ASP, all three SMEs choose the ASP because of the close localization.

There are at least two possible explanations for why the SMEs do not emphasize the cost factor. First, it can be explained by the fact that once they have reach an agreement with a service provider and pay a fix fee each month, they do not see this as the main factor any longer. The second explanation is that they do not see this as a problem before they outsource. The second explanation can be explained by the fact that ICT costs are not a big deal in these kinds of companies. These SMEs do not see these costs as the problem. Instead, the problem is how to maintain and handle the ICT so that it works properly.

The primary reason the ASPs give for non-adoption is concerns of losing control. This concern is expressed in two ways: first, the fear of losing

control over ICT assets, and second, the fear of losing control over the data. The customers do not emphasize this as a reason for not adopting the ASP concept. This is perhaps because they have already adopted the solution.

The main conclusion of the study is the disparate view of what affects the adoption or non-adoption. These perspectives can be summarized as follows. The ASPs cite cost control and the ability to decrease the cost as motives for SME's decisions. The clients report mentions three main reasons for adopting the ASP concept. First, maintenance of ICT is not the core competence, and they want a convenient solution for their ICT. Second, SMEs lack skilled personnel and necessary resources for the support of ICT. Third, the adoption is an effect of the organization's overall strategy. These findings contradict the primary reason that cost control and lower cost spur an organization to become an ASP client. In the first place this seems to be the reason but when we examine the decision in-depth, we get a profound understanding of SMEs decision-making, and find the cost perspective secondary. By showing the stakeholders' different ideas of what influences the decision, both parties gain considerable knowledge, which could influence how the service providers should handle marketing, as well as how the SMEs should handle decision-making on adopting or non-adopting the ASP concept.

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Chapter 10

A FRAMEWORK FOR THE INVESTIGATION OF THE INSTITUTIONAL LAYER OF IT DIFFUSION

Using stakeholder theory to analyse electronic commerce diffusion

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Abstract: Information technology diffusion is a complex process that has been studied from various perspectives and levels of analysis. Most studies have been done at firm level seeking to find the ways a technical innovation is introduced and used by a company. In this paper we look at the institutional layer of IT diffusion by investigating the interaction between actors in the demand and supply side of the diffusion process. We argue that stakeholder analysis is a useful tool for the examination of such interactions and we propose a framework for the investigation of the diffusion of electronic commerce. The framework can be useful for policy makers seeking to apply effective diffusion mechanisms at local, regional or national level.

Key words: IT innovation diffusion, stakeholder theory, electronic commerce

1. INTRODUCTION

Electronic commerce is a new technological phenomenon that has the potential to offer great advantages to companies and individuals. Although the benefits of electronic commerce adoption seem to be obvious (e.g. (Hoffman et al. 1996; Peppers and Rogers 1997) there is evidence that it hasn't been adopted in full. The discussion in the media about the initial success and later failure in "dot.com" companies (see for example (The

Economist 2001)) is an indication of the insecurity related with investments in electronic commerce.

The most widely reported barriers (e.g. (Farhoomand et al. 2000; OECD 1998)) related to electronic commerce adoption are mostly derived form factors such as lack of awareness about electronic commerce opportunities as well as lack of trust to electronic transactions. That makes diffusion of electronic commerce a complex issue for policy makers seeking to create a critical mass of user-companies. Additionally, the interorganizational nature of electronic commerce makes the participation of a number of stakeholders wider making the examination of their roles, views and concerns an interesting subject.

In this paper we recognize the need for in-depth investigation of issues related with electronic commerce diffusion and we propose a framework for its examination by using stakeholder theory. The paper is structured as follows. In the next two sections the innovation diffusion theory is presented with emphasis on its developments in information technology and electronic commerce in particular. Sections 3 and 4 present stakeholder theory and particularly its use in the information systems and electronic commerce literature. In section 4 a framework for synthesizing innovation diffusion and stakeholder theory for the examination of electronic commerce diffusion is proposed. The paper concludes with section 5 where a summary of the paper and ideas for the application of the proposed framework is presented.

2. DIFFUSION OF IT INNOVATION

There are various theories relate to the diffusion of innovations taking three main perspectives (Baskerville and Pries-Heje 2001). The micro perspective focusing on the internal nature of a single innovating organization and the meso and macro perspective analyzing how extra-organizational power dependencies shape the diffusion process. The most dominant and authoritative work of the latter perspective is that of Rogers's. His work has been widely sited although his framework, that has been developed during the last 35 years, has been debated (e.g. (Kautz and Pries-Heje 1996); (Elliot and Loebbecke 2000)) it is the first well-known and widespread framework for the diffusion of innovations.

According to Rogers the innovation-decision process, in which a decision-making unit passes from first knowledge of an innovation to the decision to adopt or reject it, plays a crucial role for the diffusion of an innovation. In this process five steps are defined:

- *Knowledge* occurs when a potential adopter learns about the existence on the innovation and gains some understanding of how it is functions.
- *Persuasion* occurs when a potential adopter forms a favourable or unfavourable attitude towards and innovation.
- *Decision* occurs when a potential adopter undertakes activities, which lead to the adoption or rejection of an innovation.
- *Implementation* occurs when an innovation is actually put to use
- *Confirmation* occurs when an adopter seeks reinforcement of an innovation-decision that has already been made, but the adopter may reverse this previous decision if exposed to conflicting messages about the innovation.

The rapid technological change and growth in the complexity and sophistication of computer and telecommunication systems made the diffusion of information technology a crucial issue for policy makers world-wide. Damsgaard (1996) in his study on the diffusion of Electronic Data Interchange (EDI) defines three specific layers of in the diffusion process. These are the organizational, industry and environment layers.

- The **organizational layer** consists of individual users and organizational bodies using the information technology.
- The **industry layer** consists of organizations and institutions sharing a stake in the same function, market area, or part of the value system.
- The **environmental layer** is divided into two sub regions: the institutional layer and the regulatory layer. The *institutional layer* consists of entities such as international agencies, trade associations and higher education institutions. These affect the diffusion by shaping the interaction between actors such as technology providers and potential users and thereby promote the use of the technology. The *regulatory layer* is related with telecommunication, business and privacy regulations applied by government regimes in order to set the normative boundaries for interactions between the trading partners.

An interesting approach to for the examination of the environmental layer of information technology diffusion has been made by King et al. (1994) in their effort to understand the role of the government and other institutions in IT innovation. The authors observe that although the objectives of IT-related programmatic statements issued by various government agents are clear the mechanisms that used for the mobilization of government leadership seem to be inefficient. They argue that these difficulties in the application IT diffusion polices are related with inefficient analysis of the role of institutions involved in the IT diffusion process.

In this paper we use the categorization made by Damsgaard (1996) for the examination of the electronic commerce diffusion process as this work is located at the institutional layer of the environmental layer. Additionally, we

follow the argument of King et al.(1994) about the importance of examining the role of various institutions involved in IT-diffusion. Based on the premise that a systematic examination of their roles, interests and interrelations will have interesting contributions to theory and practice, we propose the examination of the roles and interests of institutions involved in the diffusion of electronic commerce.

3. DIFFUSION OF ELECTRONIC COMMERCE AS TECHNOLOGY INNOVATION

Electronic commerce has a great effect on traditional ways of conducting business. The exchange of data within and between organizations or even business sectors is essential for its implementation and triggers organizational transformations and business processes reengineering (Wilkins et al. 2000). Changes associated with innovations related with electronic commerce use range from fundamental changes in the economies of nations, to changes in the way industries function, right through to changes in organizational practices and processes (Applegate et al. 1996; Tapscott et al. 1998)).

The effects of electronic commerce use in business and society are so profound that have been associated to those of "the steam engine, electricity, the telephone and assembly line" (Kalakota and Robinson 1999). Thus, electronic commerce, can be viewed as a kind of technology innovation since it is based on telecommunication technologies and business practices that introduce new methods in:

- Communications (e.g. (Chellappa et al. 1996))
- Business transactions (e.g. (Bryntse 1998; Crocker 1996; Currie 1999; de Kare-Silver 1998; Henning 1998))
- Market structure (e.g. (Fong et al. 1997; Giaglis et al. 1999)),
- Education (e.g. (Daniel 1999; Murison-Bowie 1999))
- Work (e.g. (Doukidis et al. 1998; HCWD 2000))

A considerable effort has been made in the literature to examine adoption patterns and diffusion practices for electronic commerce as a technology innovation. For example Wilkins et al. (2000) examine the theories of diffusion of innovation, organizational innovativeness and process theory to as they can be used for the implementation of electronic commerce into an organization. The authors focus on the purely technical issues of electronic commerce systems development and have a company and not the diffusion of innovation as a public policy.

Marshall et al. (2000) also examine the adoption and diffusion of electronic commerce and particularly to the car industry in Western

Australia but focus on the managerial and organizational needs of the specific industry sector. Similarly Thompson (2000) examines the adoption of a portal for the business community of Western Victoria in Australia.

Furthermore, Lederer et al. (2000) and Magal and Mirchandani (2001) use the technology acceptance model (TAM) (Davis 1989) to examine how the ease of use and usefulness predict application usage in the World Wide Web. Gefen and Straub (2000) also use TAM to study how the perceived ease of use (PEOU) influence the users' purchasing behaviour on the Internet. TAM has also been used by Pavlou (2001) to predict users intentions to transact electronically by integrating trust in electronic commerce. Another application of TAM has been made by Featherman (2001) who the individual adoption of Internet-based e-payment systems. Additionally, Elliot and Loebbecke (2000) use the Five Stages Innovative Process Model (Rogers 1995) to examine the adoption of four diverse pilot implementations of smart-card payment systems. In all the above cases the researchers study the adoption of a specific electronic commerce technology by individual users. There is no reference to the diffusion mechanisms used to influence companies to use and invest on electronic commerce.

The diffusion of electronic commerce to small and medium size companies has been recently investigated by Corbitt and Kong (2000); Debreceny et al. (2000); Kendall et al. (2001). The researchers focus on the investigation of the barriers related with electronic commerce adoption in Singapore and not with the diffusion mechanisms that could be used for decrease those barriers. Additionally, Riemenschneider and McKinney (2001) analyse the differences in the beliefs of small business executives regarding the adoption of web-based electronic commerce.

Finally, Boon et al. (2000) examine the adoption of Internet as a means for the promotion of electronic commerce by local governments in Australia. The research focus on one the diffusion mechanisms used by one of the actors involved in the electronic commerce diffusion process with no reference to other related entities and practices.

According to the analysis above, the research about the diffusion of electronic commerce has been focused either on the adoption of Internet technologies by individual uses or the implications that the adoption of electronic commerce has for a firm or an industry sector. It is apparent that the environmental layer for electronic commerce diffusion has been neglected in the literature with most provident focus on the organisational and less to the industry layer.

This paper tries to bring into the fore the issues related with the interaction between actors involved in the environment layer of electronic commerce diffusion. The systematic investigation of their roles, interests and interrelations could prove useful. Stakeholder theory that examines the

impact of different viewpoints of participants in an organisational situation could be proved useful for this analysis. In the next sections the stakeholder concept is introduced and the possibility of its application in the electronic commerce diffusion process is investigated.

4. THE STAKEHOLDER CONCEPT

The concept of "stakeholders" was embedded in the management thinking and research since the publication of the seminal book, "Strategic Management: A stakeholder approach" by Freeman Freeman (1984). The use of the term varies significantly, showing that the term itself is not self-evident. There most classic definition is the one proposed by Freeman (1984):

> "A stakeholder in an organisation is (by definition) any group or individual who can affect is affected by the achievement of the organisation's objectives" (p. 46)

This definition leaves the notion of stakeholder open to include virtually anyone. Certainly, there are a number of definitions that exist between these two extremes (e.g. (Cornell and Shapiro 1987; Hill and Jones 1992; Nasi 1995)).

As the nature and purpose of stakeholder theory is concerned there is a diversity of opinions on the subject. Donaldson and Preston (1995) propose a classification framework defining three aspects of stakeholder theory:

- The *descriptive* aspect means that "the theory is used to describe and sometimes to explain, specific corporate characteristics and behaviours" (p. 70)
- The *instrumental* aspect means that "the theory is used to identify connections, or lack of connections, between stakeholder management and the achievement of traditional corporate objectives" (p.71)
- The *normative* aspect means that "the theory is used to interpret the function of the corporation, including the identification of moral or philosophical guidelines for the operation and management of corporations" (p. 71)

In the following sections we study the extension of stakeholder concept from management literature to information systems in order to examine the possibility of its application to electronic commerce policy making.

The use of the stakeholder term in the information systems literature was initially used to describe the knowledge gap between managers (users) and

technical specialists (e.g. (Currie 2000)). Similarly to the management literature, there is confusion regarding the definition of the term stakeholder as well as about its nature and purpose. The study of these approaches reveals that the application of the stakeholder notion in the information systems field is predominantly instrumental or descriptive with very little reference to the normative aspect (Pouloudi 1999).

5. STAKEHOLDERS IN INNOVATION DIFFUSION

The notion of stakeholders is embedded in the innovation diffusion literature without the explicit reference at the term. More specifically, Rogers (1995) describes diffusion networks in order to emphasise the importance of interpersonal network influences on adopters both in their coping with the uncertainty of new ideas and in convincing them to adopt innovations. The notion of the opinion leadership is predominant in his work defining *opinion leaders* as: "individuals who lead in influencing other's opinions about innovations" (p.281). Another important notion in Roger's work is that of the *change agent* that is: "an individual who influences clients' innovation-decision in a direction deemed desirable by a change agency" (p.335).

Brown (1981) also refers to diffusion agency that he defines as the public or private sector entity through which an innovation is distributed or made available to the population at large. He gives examples of such entities like retail and wholesale outlets, government agencies or non-profit organisations. Other entities he describes are the *propagators* that defined as: "profit or non-profit motivated organisations or government agencies acting to induce the rapid and complete diffusion of the innovation" (p. 52).

In the case of IT diffusion and especially at its environmental layer King et al. (1994) recognise the importance of institutional intervention in IT diffusion process and list a number of institutions that influence IT innovation. These are: Government authorities, international agencies, professional and trade and industry associations, research-oriented higher education institutes, trend-setting corporations, multi-national corporations, financial institutions, labour organisations and religious institutions. The authors also mention the role that other entities such as the media and the black market can exert regarding IT innovation.

The role of intermediating institutions such as professional, trade and industry associations in the IT diffusion process has been highlighted by Damsgaard and Lyytinen (2001) in their investigation of how industry associations intervened in the diffusion of Electronic Data Interchange (EDI) in Denmark, Finland and Hong Kong. Similarly Swan and Newell (1995)

examine the relationship between professional associations and their members for the diffusion of the Production and Inventory Control (PIC) in Canada.

An explicit use of the stakeholder notion in the diffusion of electronic commerce has been made by Nambisan and Agarwal (1998). The authors identify two key groups of stakeholders – the end users (or customers) and the application or service providers. Using stakeholder and social network theory, they examine the diffusion of national information infrastructure (NII) in Singapore.

The identification of the stakeholders and the description of their roles, interests and interrelations have not been introduced systematically in any of the studies of innovation diffusions described above. Thus, tries to combine the innovation diffusion and stakeholder theory in order to make an in-depth analysis of the process of electronic commerce diffusion as it is described in the next section.

6. A FRAMEWORK FOR THE INVESTIGATION OF ELECTRONIC COMMERCE DIFFUSION

In the previous sections it was made obvious that the institutional layer within the environment layer of electronic commerce diffusion has not been analysed thoroughly and there is need for further investigation in the field. Additionally, although the investigation of roles and relationships among actors in the diffusion process is reported in the innovation diffusion literature as an important issue the notion of stakeholders has not been used systematically.

Thus, a framework that investigates the institutional layer of electronic commerce diffusion using innovation diffusion and stakeholder theories is proposed here. More specifically, the Roger's (1995) innovation decision process (presented in section 2) is extended by introducing the two main stakeholder groups reported by the author, the change agent and the decision making unit.

The aim of this framework presented in figure 1 is to have a way of organising research undertaking in the field of electronic commerce diffusion. The dark grey area in the figure represents the first phase of an empirical work where the descriptive aspect of stakeholder theory can be used to identify entities acting as change agents and decision-making units. The light grey area represents the send phase of the analysis where using the instrumental and normative aspects of stakeholder theory the characteristics of the decision making unit and the communication channels used by the

change agent will be analysed along the five phases of the innovation-decision process.

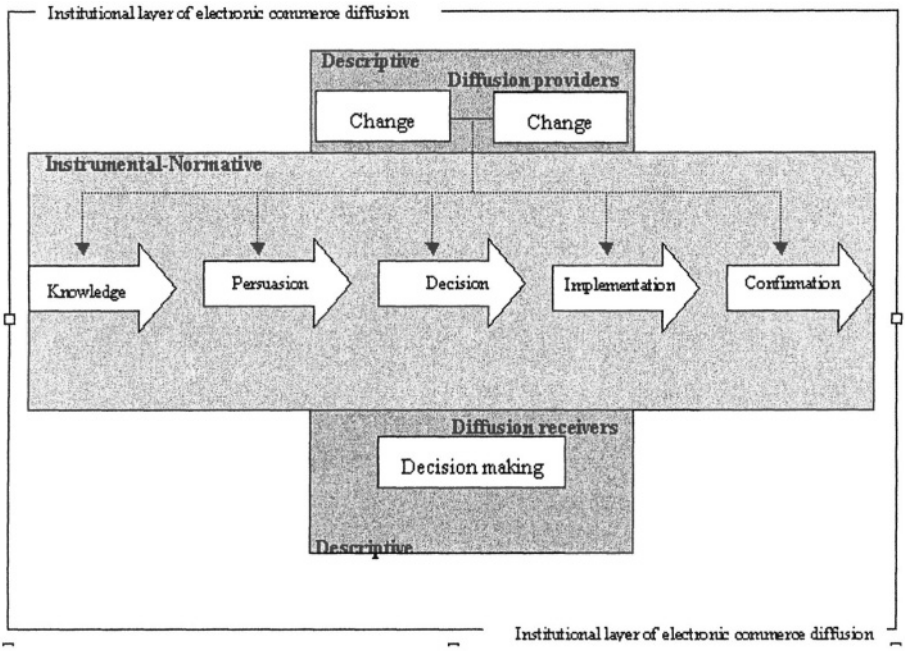

Figure 1. A Framework for Investigating Electronic Commerce Diffusion

7. SUMMARY-POSSIBLE APPLICATIONS OF THE PROPOSED FRAMEWORK

This paper gave a critical overview of the innovation diffusion literature and IT diffusion in particular. It was made evident that the institutional layer of innovation diffusion has not been investigated thoroughly, as most of the research in IT diffusion literature is focused at the organisational or industry layers. The institutional layer consists of entities that affect the diffusion by shaping the interaction between actors such as technology providers and potential users and promote the use of the technology. We argued that the use of stakeholder analysis can be a useful tool for research at that layer using the example of electronic commerce as a type of IT innovation.

Additionally, a framework that synthesises innovation diffusion and stakeholder theories is proposed as a practical instrument to investigate the diffusion of electronic commerce. Such a framework can be useful to policy

makers seeking to promote electronic commerce to the business community at local, regional or national level. Specifically, the framework has been applied in two empirical contexts related to electronic commerce diffusion (Papazafeiropoulou 2002). The first one was a European Commission funded project with the participation of chambers of commerce and business consultants active in the electronic commerce diffusion to Small and Medium Size Enterprises (SMEs) from eight countries. There the framework was used in order to identify the role of stakeholders involved in diffusion activities in three levels of adoption categories. The results of this study have been later used for the examination of the electronic commerce diffusion in SMEs in Greece within a relative initiative of the European Commission (go-digital).

The results of those studies gave an insight to the behaviour of different stakeholders and the underlying reasons for their behaviour, offering suggestions to policy makers seeking t promote electronic commerce technologies to SMEs.

Finally we believe that the framework can be used in the future by researchers involved in the investigation of various technology innovations at the institutional layer. Such technologies can be mobile computing or broadband Internet. We believe that an in-depth investigation of the views, interactions and dependencies of stakeholders involved in IT diffusion can help policy makers develop effective strategies for the promotion of IT innovation in the business community and general public.

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Chapter 11

TAKING ORGANIZATIONAL IMPLEMENTATION SERIOUSLY: THE CASE OF IOS IMPLEMENTATION

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Abstract: Despite of the rapid technical development, failures in information systems implementation are common and it seems obvious that the implementation of inter-organizational systems (IOS) include all the same possibilities for failures as intra-organizational systems – and unfortunately even some more. In this paper, we present some empirically proven means for avoiding problems during the implementation of IOSs. Our argumentation is based on the idea of organizational implementation of information systems, where the phases before and after the technical implementation are considered to be the most critical ones. The data from a case study are used to illustrate and support the ideas presented.

Key words: Organizational implementation, inter-organizational systems, intra-organizational systems, supply chain, adoption

1. INTRODUCTION

There is a growing base of knowledge on how to develop computer-based information systems, and hundreds of different IS development methods. However, it is still a persisting problem that the systems developed are hard to implement, or that they do not serve the needs of their users, management and customers when finally taken into use. Although this persistence has been noticed early and reported constantly in an intra-organizational setting (e.g. Lyytinen & Hirschheim, 1987; Keil, 1995), it seems that the problems are piling up when moving to *inter-organizational*

setting (Rayport & Sviokla, 1995; Larimo, 2001; Morrell & Ezingeard, 2002). Why do then information systems still fail?

It seems that we – as a professional community of systems developers – tend to treat the systems as separate units from the work activities stressing the development of computer-based artefact much more than the development of work (Forsman & Nurminen, 1994). However, as soon as we change our scope from the computer artefact to the activity itself, the information system can be seen as a means of structuring and developing a social system (Nurminen, 1986) and in simplifying and automating business processes (Hammer, 1990; Davenport & Short, 1990). In this field of studies we have a vast body of literature that is stressing the importance of the social system, i.e., that the most serious problem is certainly not the production of artefacts but the reflection and the reconstruction of social structures, which the artefact is supposed to support (e.g., Beer et al., 1990; Clemons et al., 1995). The simultaneous impact of process and information systems design may be dysfunctional for the performance of the social system (e.g., Larsen & Myers, 1997), if poorly implemented. This is due to the fact that it is the implementation stages rather than design stages that determine the success of an information system and process improvement project, also in the long run (Sarker & Lee, 1998).

The majority of these challenges have to do with people, their roles, objectives and tasks, not computers or computerized processes. As a consequence, also the reasons for failures taking place in implementation projects are more often human than technical. As stated earlier, these problems change in nature in inter-organizational setting, because it adds an additional self-interested layer in between. The collision of the collaborating companies' social structures is one definite source of implementation failures.

In this paper, we discuss the problems encountered in implementing information systems and present means for avoiding the problems. We emphasize the inter-organizational setting and support our arguments with the results derived from a case study.

The case study was a two-year-project that was conducted in cooperation with two large companies from the global ICT-sector. The empirical data presented in this paper refers only to one of our case companies striving for more efficient and proactive procurement activity. Our case-company is throughout this article referred to as 'organization A'. The data gathering methods of the empirical part of the project included in-depth interviews (43 persons were interviewed from organization A and its partial supplier network), documentation created in and acquired from workshops (8 workshops), separate meetings with the representatives of the case companies (12 steering group meetings), and a web-based current-state

survey of (both of) the case companies The original sample size (n) was altogether 168 responses, from which 84 were accepted after data checking and validation. Effective response rate of the survey was 50 percent.

During the first year of the project, the research was focused on inter-company cooperation and the emphasis was on supply chains/networks that for organization A consisted of three suppliers, each from a different tier. The second year of the project emphasized the analysis of the internal operations and company-specific challenges of the companies. For Organization A, the scope was in developing an application for the supplier-network that is tightly coupled with their processes and PDM, and in providing the organization A with guidelines about how to best implement the application into use.

The rest of the paper is organized as follows. First, we our view on the implementation, i.e. describe the 'lenses', through which we explain the potential and perceived problems during implementation. In the following chapter we discuss the problems of implementation in intra-organizational settings, while making a distinction between small and medium sized enterprises (SMEs) and large companies. In the last chapter we discuss the differences of intra- and inter-organizational implementation, i.e. consider how the lessons learned from intra-organizational implementation apply to inter-organizational settings, and what other issues need to be taken into account.

2. WAYS OF LOOKING AT INFORMATION SYSTEMS IMPLEMENTATION

2.1 When is Implementation?

The life cycle of information system (IS) is commonly described as a sequence of phases usually starting from strategic plans (or decision to invest in IS(s)) and ending in the replacement of old systems with a new IS(s). When IS implementation is discussed in information systems research or practice, the term implementation may be used to mean different phases of the lifecycle. Commonly implementation is defined as a process that starts from requirements gathering and specification and ends when the system functions according to the technical specifications (Kling & Allen, 1996). We call this 'traditional' view as technical implementation, or software engineering view.

In practice, every implementation project must include at least four broadly defined phases: 1) Decision to implement, 2) specification and

building up of the technical system, 3) introduction into the organization, and lastly, 4) use and maintenance. In other words, our definition of implementation is broader than the technical implementation view, as we look at implementation as an *organizational change process* that aims to some kind of organizational change or improvement – preferably in a measurable way. In this respect our view resembles closely to that presented by Kettunen et al. (2002) and depicted in Figure 1.

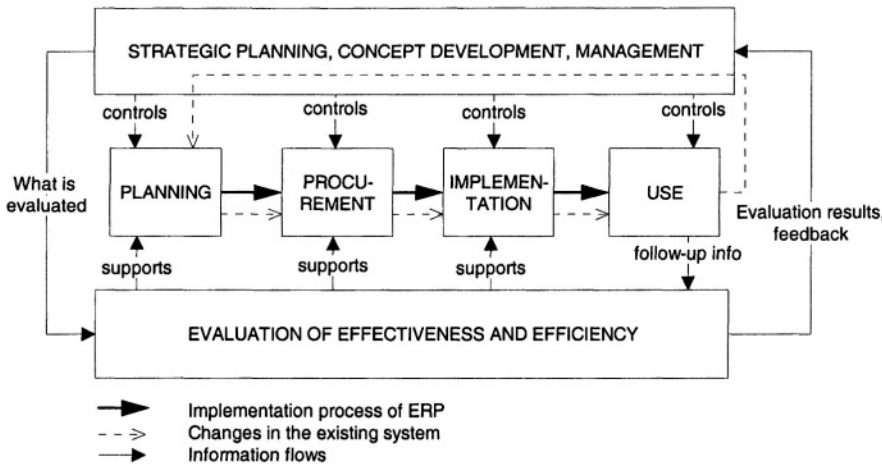

Figure 1. Information Systems Implementation Process. (Adopted from Kettunen et al., 2002).

The main points of the model (Figure 1) are: 1) the evaluation process that is carried out continuously during the actual implementation process (not only once after the implementation) and 2) the criteria of evaluation are derived from or defined on the strategic level.

On a more abstract level, our way of looking at the implementation process coincides roughly the notion of organizational implementation that according to Kling & Allen (1996, p. 269)

> ... means making a computer system accessible to those who could or should use it, and integrating its use into the routine work practices. … A long tradition of research shows that the quality of organizational implementation makes a difference in how effectively these technologies work for organizations.

The view taken on implementation also has other consequences: The criteria of implementation success are in practice defined while defining what the implementation consists of. When IS implementation is considered as a technical manoeuvre, we can measure the success of the implementation

process by comparing the functioning of the system to its technical specifications. When IS implementation is seen as an organizational change process, the criteria of evaluation must be elicited from practice, in which the system is applied. This, in turn, means that the evaluation of the system as a whole cannot be carried out before it is in productive use.

Even though the adopter (especially SMEs) must foresee some benefits in the future system in order to implement it, it does not mean that the implementation will take place (Morrell & Ezingeard, 2002; Ojala, 2001) – or that the expected benefits will be materialized even if the implementation is carried out (Markus & Keil, 1994; Larimo, 2001). However, dramatic improvements in the processes can be achieved as soon as they meet certain criteria. These criteria and the ways of carrying out the implementation process are in the focus of this paper, both in intra- and inter-organizational settings.

2.2 Why is Implementation Problematic?

The mainstream body of design literature emphasizes the use of non-contradictory utterances as a starting point for a design of an information system. It has been complemented during the last decades by an attempt to couple the rational design with customer needs by describing the systems as processes (Davenport & Short, 1990). Although these approaches are clearly challenged by the more social views on the ISs, such as socio-technical design (e.g., Mumford, 1983; Mumford & Beekman, 1995) that emphasize the importance of participation throughout the process (Butler & Fitzgerald, 1997), and even rapid redesign of the system after its initial implementation (so called reverse quality life cycle (Foreman & Nurminen, 1994). At its extreme, the users are developing the systems by themselves (Rantapuska, 2002) in a process where implementation, experimentation and design alternate.

Despite the emerging, alternative approaches, it is the rational process oriented IS design that forms the mainstream profession – the others are in practice merely considered complementary curiosities. Hence, it is easy to understand that our case organization, organization A, is building its systems primarily along the rational process design ideals, and why we start to discuss the role of implementation from this context.

There is a need to constantly evaluate the progress of IS implementation, because the system will change the existing situation. This is because the system will be a *representation of the real world situations,* and it will be *a suggested systemic solution to a problem situation of the real world.* Neither of these will make a perfect match with the real world, because they are, and will always be *representations* of the *existing* situation and *ought-to-be* –

situation. The origin of the problem is that most often the IS-artefacts are developed in a different domain than they will be used in, and too little time is given for the changes to emerge.

In Figure 2, the fundamental difference between the development of software and its organizational implementation (i.e. IS use) is made explicit using the concepts familiar from the Soft Systems Methodology (SSM) (e.g. Checkland & Scholes, 1990).

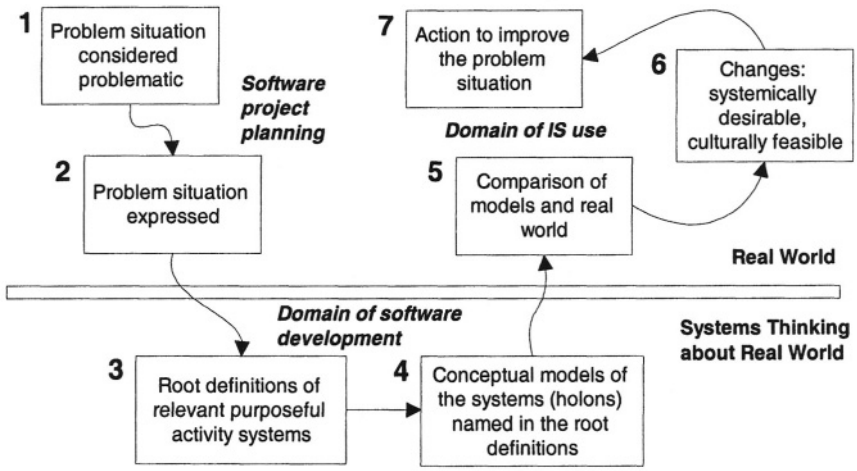

Figure 2. Conventional Seven-stage Model of SSM (adopted from Checkland & Scholes, 1990). The texts in *italics* do not belong to the original model (adopted from Reijonen, 2000).

The border between the "Real World" and "Systems Thinking about Real World" (in Figure 2.) can be seen as the barrier between two disciplines aiming at about the same goal. When the domain in the "Real World" is named as ISs development, and the domain in the "Systems Thinking about Real World" as software engineering, our message becomes rather clear. The descriptions of systems based on abstractions are necessary for building IT-based artefacts, but this does not mean that this abstract world would exist somewhere else than in the artefact and in its descriptions. According to Checkland & Scholes (1990) the question if systems are 'abstract' or 'real' causes much confusion in the systems literature. To emphasize this they state (ibid., 22):

> ... it is perfectly legitimate for an investigator to say 'I will treat education provision as if it were system', but that is very different from declaring that it is a system

We go even a bit further: In much of the literature or practice, the question about 'abstract' and 'real' is not acknowledged, but *the descriptions of systems are without consideration treated as truthful descriptions of reality, or more importantly the ought-to-be -reality.* Different views on reality also mean different views on just about every important aspect of application of IT. We maintain that adding resources to software development cannot significantly reduce the potential problems, but we must take measures more applicable in "real world".

To summarize, the phases before and after the actual software development phase, i.e. organizational implementation, must be taken seriously and resourced adequately. Even though this observation has been reported in about two decades (e.g. Swanson, 1988; Larimo, 2001), the "non-technical" aspects of implementation seem to continue to top the list of factors leading to less successful implementation projects (Larimo, 2001).

3. IMPLEMENTATION OF INFORMATION SYSTEMS

The factors affecting the success of an implementation process have been studied intensively throughout the years (e.g. Swanson, 1988; Lyytinen. & Hirschheim, 1987; Marble, 2000; Larimo, 2001). Despite of the technical development, the elderly nine-item list of critical factors by Swanson (1988) is rather representative conclusion of the results in this area of research:

1. Management commitment
2. User involvement
3. Value basis
4. Design quality
5. Mutual understanding
6. Performance level
7. Project management
8. Resource adequacy
9. Situational stability

Even though the importance of the above factors (and similar) is commonly accepted, the problem with these lists is that we can only say that the factors are important, but we cannot say how to make the implementation successful. In other words, the factors only point to activities and objects, which most often cause failures, but do not tell how to act in order to avoid them.

The factor type of research on IS implementation has mostly concentrated on implementation failures, not successes. This state of affairs has both practical and epistemological causes. From the practical point of view we should get rid of failures, and one way to try doing this is to find the

causes of failures. From the epistemological point view, the most we can after a successful implementation say is that all the factors have been adequately taken care of – and that's about all we can say. The usefulness of the factor lists is further diminished because none of the factors can be properly controlled and the relationships (and "level" if measurable) between the factors and their relative importance varies from context to context (Swanson, 1988; Marble, 2000).

Implementation of organizational changes, including those enabled or constrained by computer based information systems, is not a trivial task, but offers always a challenge to the organization. Next, we present implementation approaches that have been successfully applied in various organizations and situations.

3.1 Large Organizations – Learning Comes First

One general interpretation of the curve (Figure 3.) is that it represents the learning curve of organizational actors, i.e. the users of the implemented systems. This interpretation gets support both from a large body of empirical research, and from the fact that user knowledge is one of the most important variables that can change as the implementation proceeds. The learning process to use the information system to change the ways of work in real terms is most often a tedious, long-lasting journey. There are multiple parties with varying views, and the interactions with other activities are many, and despite the ample resources, change takes time to implement. Without going into the myriad of problems, we try to illustrate the state-of-the-art knowledge on the implementation of an IS within an existing large organization.

Whatever the change process is, 1) the top management must be involved and supportive. 2) The IS-development must have clear connection with the business development, with clearly expressed, measurable targets, to which the future users and the management can, and must commit. 3) The project itself must possess sufficient and qualified/competent resources dedicated for the project long enough. One of the biggest mistakes is to leave personnel management outside the project, as they are needed to ensure the fluent interaction between parties and to 4) help in designing new tasks for the roles. This is because in a large organization you have to get the change going and keep it rolling, otherwise the implementation will loose momentum and fall back to its previous state. (Pendlebury et al., 1998)

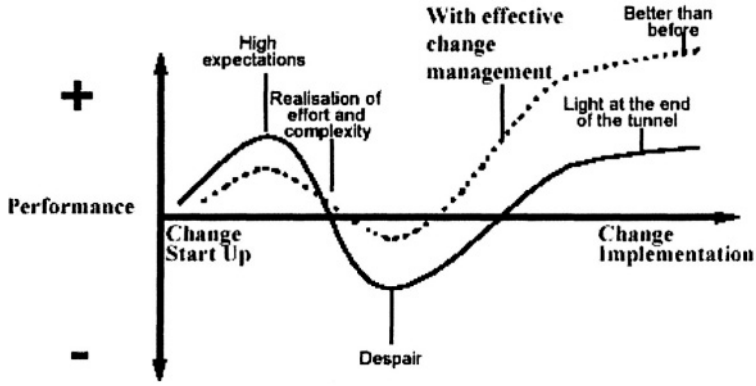

Figure 3. Performance Expectations Curve of Information Systems Implementation. (Pendlebury et al. 1998, 78; Clarke 1994, 78, 174). (Adopted from Larimo, 2001).

In Table 1, we use Beer et al.'s (1990) description on how to revitalize (i.e. To introduce permanent changes) an existing company's activities. They propose measures that have been confirmed by recent studies on business process development (e.g. Sarker & Lee, 1997). First, the intentional change (in Table 1 called 'Intervention') should start from modifying informal behaviour at the level of official social unit. This is to utilise the social coherence in order to achieve real change in the roles, responsibilities and relationships of the people. Only then should we start coaching, training, etc. at the individual level and make sure that the momentum remains by creating vision of the roles of the people in the near and long term future. It is also important to award good performance. Only in the last stage – after the social organisation is more-or-less stable- is the time to introduce the formal systems (Beer et al., 1990). However, this does not exclude the development of the system parallel to the organisational development. The key indicator of the success of change is the changed behaviour – only behavioural changes have the potential to performance improvement (ibid.; Pfeffers & Sutton, 1999).

Table 1. The Order of Changing Activities in an Organization (adopted from Beer et al., 1990).

Intervention seeks to modify	*Level of Focus*	
	Unit level	*Individual or group level*
Informal behavior	Redefinition of - roles - responsibilities - relationships	Coaching/Counseling Training Process consultation Team building
Formal design	Compensation systems Information systems Organizational structure Measurement system	Replacement Recruitment Career pathing Succession planning Performance appraisal

Let us contrast the above reasoning with the rational, process based design of IS: It supposes that the strategic IS planning (including investment payoff calculations etc.) and systems design have been carried out properly, and the aim of the organizational implementation is simple: To line out how, and by whom, the work tasks are carried out using the new system, and to train the actors these new standard procedures. This is actually just the opposite from the solution observed and suggested by Beer et al. (1990), who emphasize the importance of *designing the intervention, aiming at changing informal behaviour, before the design of formal systems.*

When these guidelines are compared with the approach applied in our case company, there is a clear mismatch. Organization A started from square 4, by developing the system first and having the users wait for the system to get finished. When the sketches were presented the suggested system was met by multiple ways of organising and conducting the business within the company. No organizational changes were achieved during the process, although a lot of learning on PDM & SCM integration took place. After the initial piloting, the case organisation returned to square 1, and found out that the implemented system will not work in the future organisation – as the internal organisation was not in a stable state.

3.2 Small Companies

In SMEs, the implementation faces different set of challenges from those of the large companies. By definition there is less people covering the same

domain than in large companies. This makes the change management easier. On the other hand this means limited resources in developing systems for the future in terms of finance and personnel. In the beginning of the project, we checked the situation in the studied partners and subcontractors of the case company with the survey questionnaire and found out that the larger the company the better equipped it was, but in general the studied companies were surprisingly well equipped and prepared for the change. Later we noticed the major concern to be the rather unrealistic expectations on the level of investment in implementing, educating and training the proposed PDM and procurement systems. Some of the companies explicitly mentioned that the integrated PDM/SCM-systems are beyond their financial resources, whereas domestic subsidiaries of foreign multinationals had these already in place.

In the earlier studies on the small company IS-implementation (e.g., Kettunen & Simons, 2001), it has been found that there is an inherent short supply of systems fit for a small company, especially in the field of PDM, SCM and ERP. The implementation time is considered too long, as Kræmmergaard et al. (2001) have shown, leading to a reduced set of functions. Similarly, the information systems' implied idea of hierarchy and control in PDM and ERP is against small business ideal (Lindgren, 2001; Kettunen & Simons, 2001). And as explained in the previous chapter, the know-how and attitudes towards change are different in many SMEs, as they are more stringent in their financial capacity.

From the IS-implementation point of view it is a significant problem for small companies that the development and project organizations are distinct, and the connection is broken down after the software is 'ready'. There is most often a need for a consultant, whose presence would ideally require weeks or months to describe the system properly. Because of the financial limitations this is seldom possible. This causes a problem, because the users are left alone with inadequate chances to change the task-technology combination to any direction.

Although participatory design and systematic participative improvement of activities are feasible paths for large companies, few small companies are familiar with these approaches. They rather tend to see IS-artefacts as solution tools at the expense of developing business processes and activities (Holopainen et al., 1999).

The remedies for the problems are also well documented. The existing processes must be developed and articulated by the users themselves. It is important, though, to avoid 'Analysis Paralysis'. This is to say that the ought-to-be future state should receive attention as well. This calls for IS-development and implementation skills in small companies – independently

whether the IS development and operation is taken care in-house or as outsourced service.

Another factor speaking for IS-development skills is the trend towards more systematic and organized work practices also in small companies. This has proved more difficult than anticipated in SMEs, but the problem has been adequately solved by simplifying and making concrete IS-development and implementation tasks (i.e., by using role games, see Torvinen, 1999) to introduce new practices. In any case, the process of IS-implementation must aim at creating and articulating the actual work activities. Thus, the description of an activity is not only a description for design, but also an instruction for the worker to follow (Kettunen & Simons, 1998; Aaltonen et al., 2002). Good targets for a process improvement are to simplify the process by reducing hand-offs (change of responsibilities), to coordinate the interim processes instead of end products for flexibility, and to minimize a customer's waiting time.

However, processes are seldom the only way to describe and develop an activity system, especially in the SME-context. Some activities are sustaining in their nature, and the worker is expected to keep the activity on track, or the system in a preferred state (Nurminen, 1986), in case something exceptional happens. This should be designed accordingly, not as a process.

The realization of the design and implementation are interconnected via a method. In most SMEs, guidelines for IS-project do not exist, or the methods are not applicable because of their complexity. There have been efforts to simplify especially the IS-design with lightweight methods such as ARIS (Halttunen et al., 1995 in Kettunen & Simons, 2001). Methods like this take also into account the connection to information architecture and implementation.

Finally, the most important implementation task is to make the objectives tangible for the SMEs. Tangible meaning that they should be derived from SME's preferred objectives, i.e., simple financial measures (Morrell & Ezingeard, 2002). These objectives will also serve as a starting point for the evaluation of achieved process improvement (see Figure 2). One conclusion is that only in case the necessary financial measures are met the more long-term objectives can be achieved.

4. IMPLEMENTATION EXPERIENCES FROM THE CASE ORGANIZATION

The literature on implementing inter-organizational systems is significantly more meagre than the literature on intra-organizational implementation. The studies on IOSs date back to the 80's, when the first

studies were performed. Then it became clear, that the success of a closed network is largely depending on the power constellations of the participants – equal partners are willing to establish joint ventures (e.g., inter-bank ATM networks), but otherwise it is the bigger party that is determining the IOS implementation standards. These observations are supported by Hackbarth & Kettinger (1997), and especially in Morrell and Ezingeard's recent case study in the UK (2002). They studied a part of a nexus of related companies of varying sizes. They found out that most of the benefits of trying to implement inter-organizational systems never realized, because the integration was not complete.

We can conclude that in inter-organizational setting we end up in a situation where also the problems are different: Large company complications are different from those of SMEs that attempt to achieve immediate, tangible and monetary benefits. Because it is also a trust and cooperation issue, the vested interests of all parties should be balanced at the network level. This means that we have rather many complicated issues to tackle on the road to successful implementation of inter-organizational systems.

To gain from the network, we should be prepared to meet the implementation success factors in each party and relationship. In other words, we should apply the implementation approach presented in this paper in each individual company, in each dyadic relationship, as well as at the level of the whole network. However, speaking in terms of probability – the odds are against the networked IS implementation success.

In a case of organization A, especially in the global setting, the implementation problems realized were as follows: Organization A had noticed a need to move towards networked model of operations, where its suppliers are increasingly expected to act independently and responsibly in their operations with organization A. As a result the concept and objectives of networked business model must be established between all the collaborating parties involved within the same network. The network participants, some of them competitors in other formations of firms, must share information with each other (availability of information), as well as allow visibility for others into their intra-company ISs.

Organization A had decided to create and implement a new IS, which optimally would aid the formation of firms to streamline their actions in real-time by providing supplier information by allowing access with limited views into organization A's ISs. The system would also establish and root desired processes, described in various process descriptions, into use with the available functionalities of the system. Additionally, the system would allow organization A to orchestrate its supply-web efficiently, as it would

maintain and control the system, and thus have access to all of the information available.

However, the creation and implementation of system faced problems because of both internal and external factors. Internally, organization A had not been able to freeze the design of the system 'to be created', as the development project had undergone multiple revisions, where the offered functionalities of the system were mostly reduced because of arisen problems. As a result, the system was not anymore able to hold onto the promises given to the intended users, which caused the targeted user group to somewhat lose interest in the project. Also, internally organization A was not able to adequately inform its suppliers about the characteristics, functionalities and benefits of the system, causing distortion in information in the field.

The IS was built to support the execution of work-tasks performed according to the process descriptions, but failed to take into account the fact that in the field the processes for executing different work-tasks, possibly because of long-term relationships between organization A and some of its suppliers, varies by suppliers. A factor often causing the implementation of ISs to fail results from the organizations failure to formally define the users roles and responsibilities, and the actual relationships of collaborating organizations' users.

The companies are different, have different objectives for cooperation, and emphasize trust on the relationship. Soon after the decision to engage to the development of IOS, there emerges a myriad of structural change issues that were shown to be critical in our case companies, and in the literature (Kopanaki & Smithson, 2002). In the conclusions, our means for avoiding implementation problems are summarized.

5. CONCLUSIONS

In implementing information systems it is crucial to remember that the implementation consists of two complimentary and partially overlapping activities, the technical implementation and the organizational implementation. In this paper we have argued that a proper organizational implementation, i.e. the integration of the IS in routine work practices, is one of the keys to more successful implementation projects. The organizational implementation gains even more importance in the case of interorganizational information systems as the number of separate, independent actors increase and several activity systems must be integrated. In accordance with this line of thinking and the empirical findings presented

earlier in this paper, we present three suggestions for organizations implementing IOSs.

1. Define, introduce and implement the new work practices first with the main actors and then implement the system in co-operation with the actual users. This approach is in line with the results presented by Beer et al. (1990), Pfeffer & Sutton (2000), and the reversed quality life cycle model (Forsman & Nurminen, 1994). This also helps in building trust with the most important partners of the network and calls for participation from the very beginning.
2. Articulate the objectives clearly, and derive the performance improvement targets from the business performance. Try to honestly communicate the costs of implementation that will be significantly higher than the development costs if done properly.
3. Do not try to integrate everything when proceeding to the information system design stage, and keep in mind that systems beneficial in one production system might not be as applicable in another (White & Prybutok, 2001).
   a) Rely on lightweight solutions for immediate, tangible benefits, e.g. by providing access to the original operative systems of the principal/hub company.
   b) An alternative solution would be to rely on a third party EDI or XML clearing house that is responsible of performing and maintaining the necessary conversions. This would require significant standard setting activity from the principal/hub company, but it can overcome some of the problem of multiple interfaces at the subcontractor contract manufacturer side.

It must be noticed that all of these procedures must be performed on the three levels of network: Within each individual company, in each dyadic relationship between the companies and at the network level. Simultaneously, the factors specific to large and small companies should meet the success factors described earlier. This clearly demonstrates the huge amount of work necessary for successful implementation of an IOS.

At the time of writing, we know that the technically oriented way of implementing an inter-organizational system in our case company was not a total success, and we do not yet know if the practice-oriented approach proposed by us will succeed. Our case organization has, however, decided to proceed in this direction in order to give its IOS a new chance.

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Chapter 12

TEN YEARS ON: REFLECTIONS ON THE PAST AND FUTURE OF 8.6

PANEL 1

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This year, IFIP WG 8.6 with its interest in the "diffusion and adoption" of information systems and technologies, celebrates its 10th anniversary. It is perhaps fitting that the occasion is formally marked by reflecting upon the group's achievements to date (its accomplishments as well as its shortcomings), and by speculating on new directions and opportunities that the next decade may offer both for the continued study of diffusion (in general), and for the development of the group (in particular). Issues related to IFIP 8.6 (and its domains of concern) are reflected in questions such as:

- What has the group so far achieved?
- Is there any evidence that for example a coherent 'body of knowledge' has resulted from the group's activities? (...or do we simply keep 'reinventing the wheel'?)
- How will new and emerging management and social theories ('managerial fashion', 'mindfulness' and 'Actor-Network Theory' for example) affect the study of diffusion and adoption if at all?

– Does the group tend too much towards a 'critical / interpretive' approach at the expense of the 'positivist / rationalistic' one? (if so, is this because it might be too 'Eurocentric'?)

– How can the group evolve to accommodate new ways of thinking? What 'new' activities should or could it engage in to stimulate and attract greater interest and membership?

These are just some examples of the sorts of questions of past and of future that IFIP WG 8.6 arguably might benefit from by addressing them in the 'formal' sense that a public discussion panel might offer. At the very least, such a panel should stimulate discussion and debate among those present at the event. It would be possible to continue such discussion and debate beyond the confines of the time / location by including a recorded synopsis in the conference proceedings.

The Copenhagen Working Conference offers an opportunity for invited panelists to present statements on some of these issues from their own perspectives in order to provoke discussion and debate among the members of the group present at the occasion, and for others later via a published synopsis of the panel event.

PANEL MEMBERS

The panel will be composed of two 'practitioners' – a long-standing member and an 'outsider', and two academics (ditto), and will be chaired by Tom McMaster, a founding member of 8.6.

PANEL CHAIR

Tom McMaster is a lecturer (Associate Professor) at the Information Systems Institute, University of Salford in the UK, and a founding member of IFIP WG8.6. His interest in technology transfer includes alternative explanations that draw on Actor-Network Theory, and he has an interest in the evolution of diffusion theory from a historical and philosophical perspective.

PANEL

Karlheinz Kautz is Professor of Systems Development & Software Engineering at the Department of Informatics, Copenhagen Business School, Denmark and Director of Studies for the course program on Computer Science and Business Administration. Previously he was employed as a senior researcher at the Norwegian Computing Center and as a lecturer at universities in Germany, Norway, England and Denmark. He is the chair of the IFIP TC8 WG 8.6 on Diffusion, Transfer, and Implementation of Information Technology. His research interests are in evolutionary systems development and system development methodologies for advanced application areas, the diffusion and adoption of information technology innovations, the organizational impact of IT, knowledge management and software quality and process improvement. He has published in these areas in journals like Information and Software Technology, Information, Technology & People, the Scandinavian Journal of Information Systems, Software Process: Improvement and Practice, IEEE Software, Journal of Knowledge Management and is a member of ACM and IEEE.

Rob Fichman is an Associate Professor of IT in the Department of Operations and Strategic Management at Boston College. His current research interests include IT innovation adoption and diffusion, management of innovation, emerging software development process technologies and real options. He has published broadly on these subjects in such outlets as IEEE Computer, Information Systems Research, Management Science, MIS Quarterly, and Sloan Management Review. Dr. Fichman holds BS and MS degrees in Industrial Engineering from the University of Michigan and a Ph.D. in Management from the MIT Sloan School of Management. Prior to getting his PhD, Dr. Fichman worked for several years as an IT applications development manager for a leading telecommunications company, and as an IT industry consultant.

Eleanor Wynn was the original "workplace anthropologist", starting at Xerox PARC in 1976. Her 1979 dissertation Office Conversation as an Information Medium introduced a host of social science studies of work practice and supported principles of user-centered design being practiced by students of Kristin Nygard at Oslo University and Aarhus. She has worked in industry at Xerox and Nortel, as a consultant to Apple, Bellcore, Citicorp and Intel, and as a visiting instructor at five different universities. She has published papers on organizational requirements for new technologies, phenomenology of Internet identities, Linux user groups as self-organizing networks and other topics. Dr. Wynn has been the editor-in-chief of Information Technology &: People since 1986 and brought the journal from

obscurity into a leading Information Systems publication. Edgar Whitley of LSE is co-editor. She currently works at the Intel Corporation.

Richard Veryard is a founder member of IFIP WG8.6 and Deputy Chair of the group. Richard works as an independent consultant and industry analyst. His background is in the software industry, advising technology vendors and users on the business deployment and management of new technologies. He writes regularly for the CBDI Forum, and has taught occasional courses at Copenhagen Business School, City University and Brunel University.

Chapter 13

NETWORKED TECHNOLOGIES – THE ROLE OF NETWORKS IN THE DIFFUSION AND ADOPTION OF SOFTWARE PROCESS IMPROVEMENT (SPI) APPROACHES

PANEL 2

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Abstract: Software process improvement (SPI) is a field of research and practice focused on improving the practice of software engineering by frequently introducing new methods and technical tools attuned to the managerial and process-oriented aspects of software development. Social networks play a key role in the adoption and diffusion of software process improvement as a networked technology. This panel addressed actual examples of SPI networks and identified key characteristics of and roles in these emergent networks.

Key words: software process improvement, SPI, social networks, networks, adoption and diffusion

1. SOFTWARE PROCESS IMPROVEMENT

1.1 Background

Software process improvement (SPI) is a field of research and practice, arising out of the need to solve software development problems such as unfinished projects, cost overruns, and erroneous systems or systems lacking functionality. Frequently, new methods and technical tools are introduced focused on managerial and process-oriented aspects of software development. SPI emerged as a result of US Department of Defence initiatives to develop a methodology to evaluate the capability of their software contractors (Humphrey and Sweet, 1987). The first widely recognized approach for this purpose was developed at the Software Engineering Institute (SEI) at the Carnegie Mellon University. The approach is based on the assumption that the quality of the development process has an influence on the quality of the product and became widely known through Watts Humphrey's book on 'Managing the Software Process' (Humphrey, 1989) which presented the Capability Maturity Model (CMM®) (Paulk, 1995) for software organizations to a broader audience. The basic intent was to apply the principles of total quality management (Dale et al., 1994) to software development by analyzing software practices and planning and implementing improvements in a step-wise manner as described in the model.

1.2 Adoption and Diffusion of Software Process Improvement

Beyond the concepts of adoption and diffusion, the theme of this conference emphasizes two terms— networked technologies—which play a central role in the context of this panel. Within the 8.6 working group, the concept of information technology is understood very broadly, spanning from Internet-based innovations to the use of system design methodologies and software process improvement approaches (Kautz, 2000).

The meaning of network requires clarification and goes far beyond a technical definition to deal with information technology and social networks, as discussed by Robertson et al. (1996) in the context of the adoption and diffusion of computer aided production management systems. If we understand software process improvement as an information technology and interpret the concept of network in this sense, then software process improvement clearly represents a networked technology.

Shortly after the appearance of SPI in North America, the approach found wide acceptance around the world (SEI, 2003a) and in the Nordic countries of Europe in engineering-oriented communities and the telecommunications industry (see Mobrin & Wästerlid, 1997). The roots in telecommunications run deep and relate, in part, to the development of related proprietary methods. Research and technology transfer agencies such as Delta in Denmark, Tieke in Finland, NR and Sintef in Norway, and IVF in Sweden promote these approaches (Kautz, 2001).

Both academic and practitioner conferences—The International Conference on the Software Process, The (European) Conference on Software Process Improvement, The (European) Software Engineering Process Group Conference—to name just a few, have developed and journals like SOFTWARE PROCESS-Improvement and Practice. And special issues of other mainstream journals are regularly devoted to this topic, e.g., IEEE Software (Curtis, 2000)

In 1994, the Commission of the European Communities launched the European Software Process Improvement Training Initiative (ESPITI) in 17 Western European countries (Kautz & Larsen, 2000) to create awareness and support the uptake of SPI methodologies. As in many other countries, a government funded research project in co-operation with industry (Johansen & Mathiassen, 1998) sustained the spread of the approaches in Denmark (Kautz & Nielsen, 2000).

2. PANELISTS

This panel addressed the question of SPI as a networked technology by bringing academics and practitioners together who are actively involved in the spread of SPI approaches. Each panellist represented a different role/s and organization. The panellists' backgrounds included:

- founding members of the IFIP WG 8.6.
- participant in a technology transfer organization
- process consultant
- expert adviser for the EU and US governments
- action researcher
- manager of SPI consulting organization
- author of Capability Maturity Models
- participant in a professional association and SPI network
- assessor, with experience performing organizational diagnostics and process assessments
- participant in national/international research and diffusion projects

- client for the services of several technology transfer and consulting organizations, and
- researchers in software process improvement, knowledge management, workforce management, and organizational improvement.

3. SPI AS A NETWORKED TECHNOLOGY

In the context of software process improvement, two key questions arise:

1. Whether and, if yes, which role(s) do the different organizations, agencies, and individual stakeholders play in the diffusion and adoption of these SPI approaches?
2. How do inter-organizational and interpersonal networks operate in such an environment?

3.1 The Role of Stakeholders and Networks in SPI Adoption

Panellists addressed the topic of networks in software process improvement, in the context of diffusion of SPI to individuals and organizations, and in the context of adoption of these practices within a software-producing organization. In these networks, a number of roles are filled by different organizations, agencies, and individual stakeholders. These roles include Researcher, Practitioner, Star, Gatekeeper, and Liaison.

In Figure 1, a basic Scandinavian network is shown. Key nodes include:

- researcher nodes, such as the node labelled "SEI";
- star nodes, representing professional groups, such as DELTA's SPI group, which is an example of a regional SPIN (software process improvement network) (Fowler, 1993; SEI, 2003b);
- gatekeeper nodes, such as that played by a key researcher at the University; and
- adopter organizations and their practitioners and liaisons, who serve to link these individual organizations to the larger network.

Nodes not represented in this figure, but which serve as transient organizational entities or groups in SPI adoption and diffusions, include conferences, such as the Nordic SPI conferences or the annual European SEPG conference.

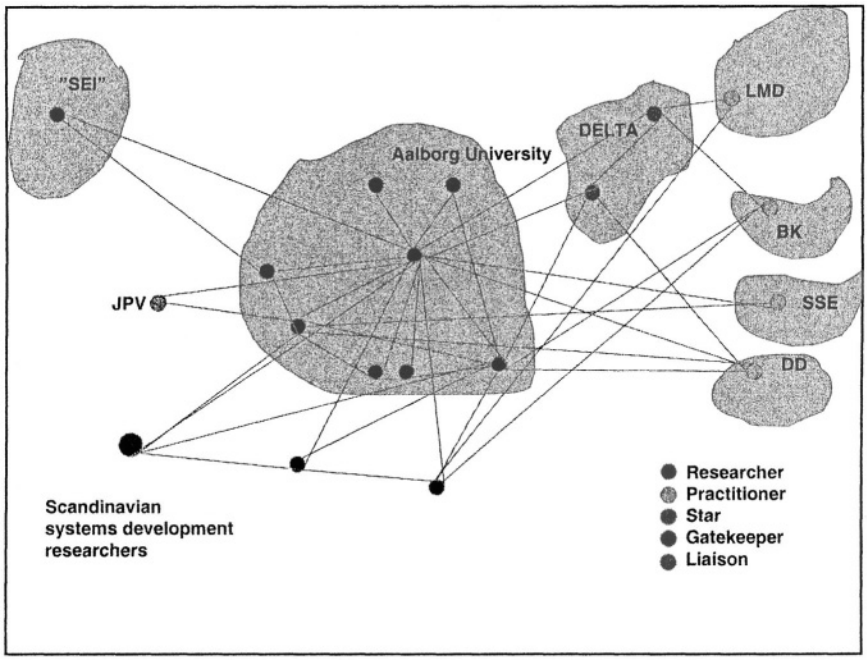

Figure 1. Basic Scandinavian Network [Source: Nielsen]

Figure 2 shows this basic network, overlaid with a map showing the extent of the overall Scandinavian SPI network. Changes over time in this network occur as a result of individuals moving on to new positions, such as has recently happened with the star node; organizational decisions about adoption or non-adoptions; and the use or non-use of various partly proprietary methods. A new network has evolved, focusing on knowledge management in software process improvement, but it has a different topology than other networks shown here because the star is no longer present in the network and fewer companies are involved. Thus, networks are established, are active for a while, and are partly dismantled, only to re-emerge at a later stage in a new form. These networks are emergent organizations. In these networks, stars, gate keepers, and liaisons are relevant roles to perform.

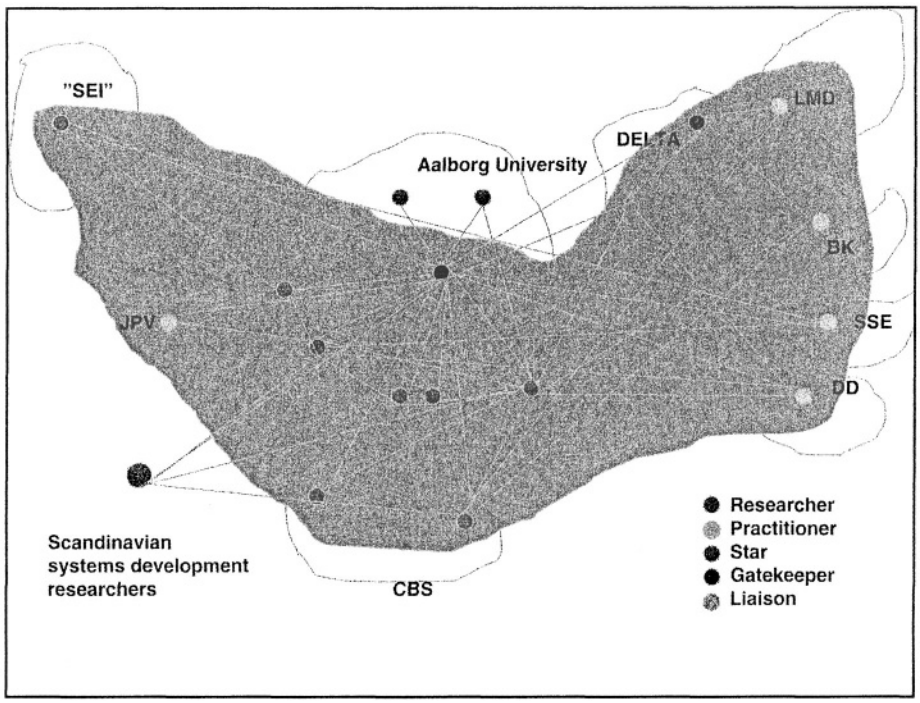

Figure 2. Scandinavian SPI Network [Source: Nielsen]

A number of forces affect these emergent networks, including:

- Individuals' interests
- Competition between research groups
- Outside influences from the research communities
- Financial conditions
- Confidentiality and intellectual property rights

A second set of networks were discussed that were internal to an adopting organization. Key roles in these networks include the practitioners or liaisons who link the organization to the larger SPI network; management, specifically senior management, for their support for the SPI efforts; the organization's software engineering process group (SEPG), who act as change agents and facilitators for the SPI efforts; technical working groups or teams engaged in focused improvement activities, such as implementing a given key process area of the CMM; and the individual stakeholders or practitioners within the organization, who are really the targets of the overall SPI effort.

Interactions between these networks occurred not just through the liaisons, but also through other mechanisms. These included interventions within the organization or with its management team by a gatekeeper or a key external consultant. Consultants bring the experience of having seen and

having tried things before which the adopter organization often lacks; while the SPIN can share experiences that they have had across organizations.

This illustrates the key role that social networks play in the diffusion and adoption of these SPI approaches. Next, we address key aspects of how inter-organizational and interpersonal networks operate in such an environment.

3.2 Network Mechanisms

We were able to identify a number of mechanisms in networks, which support and/or hinder the diffusion of SPI approaches.

- Importance of network: Network connections between adopting organizations and the larger external network are extremely important in supporting adoption decisions by demonstrating evidence of visible success, bringing in scarce expertise into the organization to support unfreezing or change activities or building commitment/sponsorship, building skills and mentoring, and sharing lessons across organizations.
- Proxies: While certain research centers, such as the SEI, are essential to developing innovations, it may be that certain key individuals may act as a proxy for the organizational innovation source. In the case of the Scandinavian SPI network, while much information was available from the SEI through classes in the USA or from its website, the proxy for the SEI in the network was a single, well-respected researcher/consultant who worked extensively with Scandinavian companies and universities.
- Key movers: The role of influence is seen in these networks. Certain organizations, because of their role as stars or because of their perceived position within industry, are seen as being key movers or reference cases to emulate.
- Collaborative groups: These groups, such as a SPIN, provide a collaborative forum for individuals to share different perspectives, understand their different focus and drivers for change, and share experiences in a manner mostly free of competitive pressures. Involvement in these groups reinforces adoption and diffusion decisions, and supports persistence in managing change.
- Multiple, interlocking networks: The liaisons in adopting organizations were linking pins between multiple, interlocking networks. One network was the larger regional or global SPI network, while another was the local process improvement-focused network within their organization.

- Emergent properties of networks: These networks adapted over time, as individuals changed positions, as research postures matured, as SPINs and conferences grew.

4. ISSUES AND CHALLENGES

Successful software process improvement activities rely on a network of networks. These multiple, interlocking networks serve to make this a very small world and support adoption and diffusion of SPI innovations through a wide variety of roles that are involved in these networks. These include nodes internal to the adopting organization, such as individual practitioners, improvement teams or technical working groups; software engineering process groups, organizations and their management; as well as external nodes, such as consultants, university researchers, and SPIN groups and conferences.

In these networks, there is an apparent tension between purposeful activities and accidents and serendipity. Personal connections and influence are extremely important in effective linkages. Tensions also exist between collaborative and competitive behaviours, especially in the larger, intra-organizational SPI networks or the SPIN groups.

Differences in developing effective adoption and diffusion activities also appear in examining the kinds of entities that are prevalent in intra-organizational and inter-organizational SPI networks. In intra-organizational networks, the star nodes, such as SPIN groups, are often seen as communities of practice, operating as a self-organizing group. Within an organization, the SEPG is often a task force team tasked to perform certain activities. The strength of ties (close vs. loose), level of formality (informal vs. highly structured), and organizational structures (traditional, hierarchical structure vs. a looser volunteer committee) are all characteristics that can differentiate internal star groups, such as an SEPG, and external star groups, such as a SPIN group. Thus, while both are network structures, the approaches for supporting adoption and diffusion of software process improvement may differ between intra- and inter-organizational networks.

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Chapter 14

OPEN SOURCE SOFTWARE: PLACEBO OR PANACEA?

PANEL 3

JESPER HOLCK[1], DANNY PETTERSON[2], KIM ØSTRUP[3] and BRIAN FITZGERALD[4]

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Abstract: The Open Source Software (OSS) concept abounds with paradoxical issues which is one of the primary reasons why it is so interesting: For example, the basic premise that software source code—the 'crown jewels' for many proprietary software companies—should be provided freely to anyone who wishes to see it or modify it. Also, the tension between collectivism and individualism in the overall movement, the balance between modesty and supreme ego on the part of 'code god' project leaders, the balance between anarchy and control at the project level, the manner in which organisations make money from free software. These are all extremely interesting issues which will be the focus of this panel.

1. OPEN SOURCE SOFTWARE: PLACEBO OR PANACEA?

Open Source Software has attracted enormous media and research attention since the term was coined in February 1998. The concept abounds with paradoxical issues which is one of the primary reasons why it is so interesting: For example, the basic premise that software source code—the 'crown jewels' for many proprietary software companies—should be provided freely to anyone who wishes to see it or modify it. Also, there is a tension between the altruism of a collectivist gift-culture community and the

inherent individualism that a reputation-based culture also implies. Furthermore, its advocates suggest that OSS represents a paradigm shift in software development which can solve what has been somewhat controversially termed the 'software crisis' (i.e. systems taking too long to develop, costing too much, and not working very well when eventually delivered). These advocates point to the quality and reliability of Open Source Software, its rapid release schedule, and the fact that it is available without charge. Other supporters of OSS believe that it is an initiative which has implications well beyond the software field and suggest that it will be the dominant mode of work for knowledge-workers in the information society.

However, despite these claims, a closer analysis of the OSS phenomenon suggests that there is a complex range of challenges which must be overcome if OSS is to survive and prosper. This panel identifies and discusses these factors. Jesper Holck will describe two OSS projects with a focus on how they must carefully balance anarchy (in the sense of individual autonomy) with control. Danny Petterson will put the case for using the OSS model successfully in a small IT integrator company, and Kim Østrup will discuss future potentials and limits of OSS and open standards from an industry point of view. Finally, Brian Fitzgerald will consider fundamental challenges to the OSS model from software engineering, business/economic, and socio-cultural perspectives.

1.1 Organization of Open Source Software Development

Jesper Holck will focus on the organization of OSS projects. In order for an OSS project to be successful, it has to attract both users and developers, and in doing this it has to make a careful balance between anarchy and control. In order to be accepted by large communities of users, the software has to be of high quality, be effectively distributed, and users must be able to receive satisfactory support; these aspects all point to a need for high level of quality control. On the other hand, in order to attract voluntary developers, it should be easy and rewarding to join the project, which points to a need for minimizing the bureaucratic procedures necessary when contributing to the project. Additionally, many major OSS projects face the challenge of coordinating the efforts of hundreds of developers, geographically distributed over several continents and seldom or never meeting face-to-face. In his talk Jesper will outline how two large OSS projects (FreeBSD and Mozilla) have organized themselves in order to attract both users and developers and balance anarchy with control.

1.2 Selling and Implementing Open Source Software

Working with Open Source in an organization selling and implementing IT solutions, Danny Petterson will discuss the value Open Source applications and operating systems can bring to costumers and the issues regarding the sales of Open Source-based solutions.

The presentation will focus on:

- Open Source — how to sell know-how
- What kind of customers adopts Open Source?
- What kind of Open Source is a commercial success (from the solution seller's point of view)?
- Examples of small costumer-solutions for different tasks

1.3 Open Source from an industry perspective

With his extensive background both in IBM, a major player in the Open Source Software field, and in numerous Danish IT-related organizations, Kim Østrup will in his presentation focus on

- The need for Open Platforms, Open Source, and Open Standards
- The development model of Open Source Software
- The visions of Autonomic Computing and Grid Computing

1.4 Challenges to Open Source Software

Brian Fitzgerald will focus on challenges to the OSS model from the following perspectives:

1.4.1 Challenges from a Software Engineering Perspective

- OSS is not a revolutionary paradigm shift in software engineering
- Not enough developer talent to support increased interest in OSS
- Code quality concerns
- Difficulties of initiating an OSS development project and community
- Negative implications of excessive modularity – the Achilles heel
- Insufficient interest in mundane tasks of software development
- Version proliferation and standardization problems

1.4.2 Challenges from a Business Perspective

- Insufficient strategic nous
- Free beer rather than free speech more important to OSS mass market
- Insufficient transfer to vertical software domains

– OSS a victim of its own success

1.4.3 Challenges from a Socio-Cultural Perspective

– OSS has become part of the establishment
– Burn-out of leading OSS pioneers
– Unstable equilibrium between modesty and supreme ability required of OSS project leaders
– Alpha-male territorial squabbles in scarce reputation culture

2. ABOUT THE PANELISTS

Jesper Holck is a Master of Science from the Danish Technical University with a PhD in Computer Science from Roskilde University. He has held positions at Christian Rovsing, the Danish Technical University, Roskilde University, and the Business College in Ballerup; he is currently Assistant Professor at Copenhagen Business School, where his main research area is systems development.

Danny Petterson is educated as an IT-professional from Roskilde Business School, Denmark, in 1992, and has worked with Unix, Open Source, databases and storage systems since 1996. The experience has been in a variety of functions as a systems administrator, consultant and researcher. For the time being Danny is employed in Dimension Danmark A/S with focus on commercial implementation and support of Unix, Open Source and database-solutions.

Kim Østrup graduated in economics with a Bachelor of Politics from the University of Copenhagen before joining IBM Denmark in 1971, where he today is External Programs Executive for Nordic. Østrup also holds a number of positions in industry, including vice-chairman of the Danish IT-industry Association, chairman of the Danish electronic research Library, and member of the boards of ITEK (the Danish IT trade organization), the IT University of Copenhagen, and the Danish Chamber of Commerce.

Brian Fitzgerald holds the Frederick A Krehbiel II Chair in Innovation in Global Business and Technology at the University of Limerick, Ireland. He has also held positions as Visiting Professor at Northern Illinois University in the US, the University of Gothenburg in Sweden, and Northumbria University in the UK. He has been Associate Editor for the *Information Systems Journal* and *Data Base,* and his publications include 6 books and more than 70 papers published in international journals. He has also presented research at a number of international conferences, and spent more than fifteen years in industry, prior to entering academia.

Chapter 15

THE DIFFUSION AND ADOPTION OF MOBILE COMPUTING

PANEL 4

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2 University of Michigan, United States

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INTRODUCTION

Two major disruptive innovations in telecommunications- internet and mobile telephony- were both driven and enabled by extensive standardization work. Both of them were not invented nor standardized within the existing standardization organizations (SDOs) like ITU or CCITT. In fact, both of the created over time their own standardization bodies and regulatory regimes which have due to their success become global and very influential (IETF, W3 vs. ETSI and 3GPPP, 3G2PPP). Both of these were also largely driven by new inventions in computing and microprocessors, and later on in software capabilities. The main difference is that while Internet was adopted largely through grassroots development, the innovation and adoption in mobile telephony was initiated and driven buy large operators and alter on manufacturers. Moreover, the deployment of all mobile telephony generations involved heavy governmental intervention in frequencies, licensing, tariff setting and standard adoption policies. Now when they are merging a set of new challenging issues which relate to the nature of standardization and the diffusion of services need to be examined.

According to a recent survey, conducted by Merrill Lynch in December 2000 [Tarter et al (2001)], wireless e-business enabled by the coalescence of these technologies will be the top investment priority for large Fortune 500

companies. Solomon Smith Barney [Margolin, M. (2000)] estimates that wireless access to these Fortune 500 companies will comprise 10% of all Internet traffic by 2005. Adherents believe that the real power of wireless e-business is in its potential to optimize communications, thereby improving responsiveness to customers, improving the ability to accelerate and process decisions within and between organizations, and by blurring conventional device boundaries, to truly enable the conduct of transactions at any time and in any place [Martinez, P. (2000), Tarter et al (2001)].

The purpose of the panel is to explore the evolution of mobile internet and telephony as an interplay of three major forces: market needs and learning from use, technological innovation driven by computing capability change, and regulatory intervention as dictated by the infrastructural nature of the deployment due to resource allocation, licensing and demand creation, and industrial policy. The panel will consist of offer four distinct view points to standardization and mobile internet diffusion:

1. how mobile telephony standardization has been driven by and enabled by the different institutional configurations that govern the relationships between markets, innovation system and regulatory bodies. These relationships are radically different in Scandinavia, US and Japan and largely influenced the evolution of the standards and the scope of the standards and the further deployment of wireless internet. In particular the analysis will discuss the changing nature of "telephony services" from fixed wired universal service into personal, variable and wireless service and how this has been reflected in the standardization efforts. (Kalle Lyytinen)
2. how wireless internet standardization efforts embed designs can be interpreted in the light of theories of design and implementation- especially how theories of design, social construction of technologies and politics of technological changes need to be interwoven in the analysis of mobile internet standardization that seeks to achieve infra-structural status (Vladislav Fomin)
3. How wireless internet standardization and standard setting has influenced the garnering and development of technological and industrial capabilities and how the standardization focus and context affect specific regional and industrial policies (Bengt Dalum)
4. what factors in the market may influence the adoption and diffusion of such technologies and what are the important inhibitors to the diffusion and adoption of mobile internet? Through the literature, we identify four main potential inhibitors to mobile commerce and determine whether these potential inhibitors were in fact genuine inhibitors impeding mobile commerce diffusion in Australia. The research model helps explore how

each of the purported inhibitors impacts usability, usefulness and relative advantage which had been identified through the literature in combination with the practical perspective, as specifically relevant to the rate of diffusion of mobile commerce technology in Australia. (Deborah Bunker).